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Solar Thermal Power Generation

Quarterly Update July-September 1977

TECHNOLOGY APPLICATION CENTER
THE UNIVERSITY OF NEW MEXICO
ALBUQUERQUE, NEW MEXICO 87131

NASA

SOLAR THERMAL POWER GENERATION

A BIBLIOGRAPHY WITH ABSTRACTS

QUARTERLY UPDATE JULY-SEPTEMBER 1977

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THE UNIVERSITY OF NEW MEXICO
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A DIVISION OF THE INSTITUTE FOR APPLIED RESEARCH SERVICES (IARS)

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INTRODUCTION

In our ever increasing effort to disseminate the latest information on solar potentials in power generation, the Technology Application Center has once again expanded the computer data base input to the quarterly update. Sections of the bibliography having greatly increased data input include 10,000 Energy Overviews, 11,000 Solar Overviews, and 12,000 Economics and Law. The most significant increase in data input is in section 13,000 Thermal Power. Areas showing slower development are sections 14,000 Thermionics and 18,000 Residential Power Systems.

We appreciate comments and suggestions the reader may have that would improve the utilization of this bibliography, consequently resulting in a more reader-responsive publication.

Geoffrey C. Bell
Technical Editor

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GUIDE TO USE OF THIS PUBLICATION

A number of features have been incorporated to help the reader use this document. They consist of:

-- A TABLE OF CONTENTS listing general categories of subject content and indexes. More specific coverage by subject title/keyword and author is available through the appropriate index.

-- CITATION NUMBERS assigned to each reference. These numbers, with the prefix omitted, are used instead of page numbers to identify references in the various indexes. They are also used as TAC identifier numbers when dealing with document orders; so please use the entire (prefix included) citation number when corresponding with TAC regarding a reference. An open ended numbering system facilitates easy incorporation of subsequent updates into the organization of the material. In this system, numbers assigned to new citations in each category will follow directly the last assigned numbers in the previous publication. The citation number of the last reference on each page appears on the upper right-hand corner of that page to facilitate quick location of a specific term.

-- A REFERENCE FORMAT containing the TAC citation number, title of reference, author, corporate affiliation, reference source, contract or grant number, abstract and keywords. The reference source tells, to the best of our knowledge, where the reference came from. If from a periodical, the reference source contains the periodical's title, volume number, page number and date. If for a report, the reference source contains the report number assigned by the issuing agency, number of pages and date.

--An INDEX OF AUTHORS alphabetized by author's last name. A reference's author is followed by the reference's citation number. For multiple authors, each author is listed in the index.

--An INDEX OF PERMUTED TITLES/KEYWORDS affords access through major words in the title and through an assigned set of keywords for each citation. A reference's title is followed by the reference's citation number. In the indexes, all the words pertaining to a reference are permuted alphabetically. Thus, the citation number for a reference appears as many times as there are major title words or keywords for that reference. The permuted words run down the center of an index page. The rest of the title or keywords appear adjacent to a permuted word. Since a title or set of keywords is allowed only one line per permuted word the beginning, the end, or both ends of a title or set of keywords may be cut off; or, if space permits, it will be continued at the opposite side of the page until it runs back into itself. A # indicates the end of a title or set of keywords while a / indicates where a title or set of keywords has been cut off within a line.

10,000 ENERGY OVERVIEWS

ST77 10078 AUTHORIZING APPROPRIATIONS FOR THE ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION. CONFERENCE REPORT TO ACCOMPANY H.R. 13350

(House of Representatives, Washington, DC), 1976, EDB-77:036067
The Committee of Conference, after considering a proposed Senate amendment and inserting its own amendment, authorized the following: (a) for nonnuclear energy research, development, and demonstration of fossil, solar, geothermal, and other forms of energy for energy conservation, and for scientific and technical education, $1,175,671,000/ (b) for nuclear energy research and development, basic research, space nuclear systems and other technology, uranium enrichment, national security, and related programs, $5,271,679,000/ and (c) for environmental research and safety, basic energy sciences, program support, and related programs, $691,795,000. Specific program breakdowns under each of the above are presented.

(BUDGETS, GOVERNMENT POLICIES, LEGISLATION, RESEARCH-PROGRAMS)

ST77 10079 ENERGY: A CITIZEN GUIDE TO COMMUNITY DEVELOPMENT - A BOOKLET

(Vermont Tomorrow, Montpelier, VT), Vermont Tomorrow, 1976, EDB-77:036117, PC$1.00
A 1976 energy law enacted in Vermont allows towns to appoint energy coordinators, provides impetus for energy and energy conservation projects, and involves all citizens in improving the energy situation. Vermont relies heavily on petroleum (76 percent compared to a national average of 50 percent). The greatest conservation efforts are aimed at transportation and residential demand, which together account for over 72 percent of the state's energy use. This guide to citizens outlines the procedure for setting up local energy comittees and coordinators. A sample community survey is included with suggestions for effecting a good response. Projects for a community wood supply, school energy conservation, an energy conservation corps, methane production, and home winterization are described. Individuals and neighborhoods are encouraged to form carpools and develop small-scale hydroelectric, wind power, and solar projects. Examples of individual activities and the resulting energy savings are included in each section. Public policy changes to increase conservation efforts include tax exemptions and low-interest loans for the use of alternative energy sources, bikeways, and state energy planning. A resource section lists 111 private and government organizations, companies, and literature for further information.

(ENERGY CONSERVATION, GOVERNMENT POLICIES, VERMONT)

ST77 10080 ENERGY ALTERNATIVES

Anon, (ASME, New Mexico Sect, New York, NY), Proc of the Annu ASME Symp, 16th, Albuquerque, NM, Feb 26-27, 1976, Publ by ASME, NM Sect, New York, NY, p. 245, 1976
Seventeen papers and sixteen abstracts of papers are presented. The topics discussed include nuclear energy, biomedical engineering, solar energy, wind energy, geothermal energy, tidal power and various energy alternatives.

(WIND, TIDAL POWER)

ST77 10081 ENERGY DEVELOPMENT 2

Anon, (IEEE Power Soc, Energy Dev Subcomm, New York, NY), Energy Dev, IEEE Power Eng Soc Pap, 196 p., Publ by IEEE, New York, NY, 1976, Cat n 76CH1102-3 PWR
The 25 papers comprising this volume report on the developments in the fields of unconventional electrical energy production. Topics covered include energy storage, solar energy, wind power, MHD, hydrogen transmission, geothermal power, coal liquefaction, and energy from solid waste.

(STORAGE, WIND)

ST77 10082 ENERGY FUTURE TIMETABLE

Energy, Stamford, CT, V 1:16-17, N4, 1976, EDB-77:036068
A chart of the activities of over 200 companies involved in energy research indicate we will still be dependent on imported oil by the year 2000. Thirty-two alternate energy sources are listed with 1976 ERDA direct outlay and research and development funding, number of companies in the sample (with the number of commercial companies indicated), years to commercial availability, and the maximum potential contribution to national energy supplies. ERDA is contributing to all areas except for nuclear fusion migma, hydrogen production by fusion, and gas-turbine topping cycle retrofitting. Most ERDA outlay is for the liquid metal fast breeder reactor (LMFBR) and magnetic nuclear fusion. ERDA research and development funds support virtually all the work on solar and ocean thermal, large wind generators, magnetic and laser nuclear fusion, magnetohydrodynamics, thermionics, potassium turbines, and molten-salt reactors. Estimates are given of when each source will reach maximum potential contribution range from no estimate to 10 percent by the year 2000. Most promising estimates are for oil shale, high-Btu coal gasification, coal liquefaction, gas-turbine topping cycle retrofitting, and the LMFBR. Of the 228 companies surveyed, 69 are commercial.

(COMPARATIVE-EVALUATIONS, ENERGY-DEMAND, FORECASTING, RESEARCH-PROGRAMS, WIND)

ST77 10083 ENERGY IN THE PACIFIC BASIN. PROCEEDINGS OF A CONFERENCE HELD DECEMBER 17-19, 1975, IN MALIBU, CALIFORNIA. BOOKLET SUMMARIZING MEETING

(Pepperdine University, Malibu, CA), 1975, EDB-77:061474
This booklet contains the summaries (given on the third day, Dec. 19) of the technical sessions of the first two days (Dec. 17 and 18, 1975). Following introductory remarks by Dr. Edward Teller, the other subjects covered and the chief speaker for that subject were: coal, Dr. Gerlad W. Johnson/ gas and oil, Dr. Joseph Rensch/ nuclear energy, Dr. Bernard L. Cohen/ solar energy, Dr. David Lindley/ geothermal energy, Dr. Eugene M. Grabbe/ and conservation, Dr. Willard F. Libby.

(ENERGY CONSERVATION, REGIONAL-ANALYSIS)

ST77 10084 ERDA AUTHORIZATION, FISCAL YEAR 1977. PART IV. BASIC ENERGY SCIENCES. HEARINGS BEFORE THE SUBCOMMITTEE ON ENERGY RESEARCH, DEVELOPMENT AND DEMONSTRATION OF THE COMMITTEE ON SCIENCE AND TECHNOLOGY, U.S. HOUSE OF REPRESENTATIVES, NINETY-FOURTH CONGRESS, SECOND SESSION, FEBRUARY 26, 1976

(Committee on Science and Technology, Washington, DC), 1976, EDB-77:054775
Hearings were held on the 1977 ERDA budget for research activities in materials and molecular sciences and the significance of ERDA programs to public utilities. ERDA budget requests for basic energy science showed an increase of $6.8 million, or four percent. Changes in direction increased funding for non-nuclear technology, including fossil, solar, geothermal, conservation, and environmental. Funding was to be reduced for fission- and fusion-related research and science base. Data included program objectives and operating, capital, and construction expenses for specific facilities. Representing ERDA were Dr. Robert L. Hirsch and Dr. James Kane. Dr. Larry Hobart of the American Public Power Association stressed the need for adequate funding of reliability demonstration projects for advanced fuel technologies, such as fuel cells, diesel bottoming cycles, Stirling engines, and improved gas turbines. These offer the potential of more efficient use of conventional fuels, more environmentally acceptable power, and a capacity for smaller-scale equipment.

(DEMONSTRATION-PROGRAMS, ENERGY CONSERVATION, LEGISLATION, RESEARCH PROGRAMS)

ST77 10085 FRONTIERS OF POWER TECHNOLOGY CONFERENCE, 9TH ANNUAL, PROCEEDINGS, 1976

Anon, (Oklahoma State Univ, Sch of Electr Eng, Stillwater, OK), Front of Power Technol Conf, 9th Annu, Proc, Oklahoma State Univ, Stillwater, OK, Oct 27-28, 1976, Publ by Oklahoma State Univ, (Univ Ext Program), Stillwater, var pagings, 1976
The topics of main concern are corporate financing and planning, load management and peaking and new concepts in energy conversion and storage. Altogether, 16 papers are included. Some titles are: Social Impacts of Advanced Domestic Load Management Systems, A Forecast of Alternate Energy Systems for Power Generation 1975-2000, Application of Wind Power to the Electric Power System, Multimode Practical Solar-Thermal-Electric Power Plants, The Potential and Applications of Energy Storage, Underground Compressed Air Energy Storage, Design and Testing of a Prototype Savonius Wind Machine, Development and Tests of Superconducting Magnetic Energy Storage Systems Components, Solar-Supplemented Heat Pump Experience in Home Heating.

(STORAGE, WIND, POWER TECHNOLOGY)

ST77 10086 IGT RESEARCH ON NONFOSSIL FUEL SOURCES

Gas Scope, V 35:1-8, Spring 1976, EDB-77:054930
IGT's involvement in the development of nonfossil energy sources is reviewed. In the late 1950's IGT began its program on the development of fuel cells, which use pure hydrogen or other hydrogen-containing gases to generate electricity. IGT became interested in 1966 in the Munters Environmental Control (MEC) system for residential and commercial heating, cooling, and humidity control (described in Gas Scope No. 28, summer 1974, also this issue, p. 11). Now incorporating solar energy and dubbed Solar-MEC, it is presently being field-tested. In 1970, IGT began research that led to the biogas process, and anaerobic digestion process for the conversion of organic wastes and plant life (biomass) to methane (described in Gas Scope No. 31, spring 1975). Since the 1960's, IGT has been looking into the possibility of hydrogen as a medium for energy transmission, and more recent projects have been concerned with ocean thermal energy conversion and wind power. Historically it has taken about 60 years to make the transition from one predominant source of energy to the next.

(ANAEROBIC-DIGESTION, HYDROGEN-BASED ECONOMY, RESEARCH PROGRAMS, WIND, OCEAN ΔT)

ST77 10087 INFORMATION BY THE FEDERAL GOVERNMENT: PROGRAMMES OF THE COMMISSION OF THE EUROPEAN COMMUNITIES FOR RESEARCH AND DEVELOPMENT ACTIONS IN THE FIELD OF ENERGY

Bundesrat - Drucksache, p. 3-40, N73250, Feb 1975, EDB-77:036066, In German
The commission proposes to classify the strategic fields according to the two main criteria - the period of time needed to reach notable results and possible quantitative effects - as follows: (a) actions which, in not much more than 10 years, can make a considerable contribution to the energy supply of the EC (and which, above all, can reduce mineral oil imports): energy conservation, fossil fuels, nuclear energy (fission); (b) actions which are suitable to make, on a long-term basis,

a decisive contribution to the energy supply of the EC: nuclear energy (fusion); (c) horizontal actions of strategic importance: model simulation; (d) actions which are suitable to make, not later than in 20 years, or earlier, under certain specific regional conditions, a decisive contribution to the EC's energy supply: hydrogen as a new energy carrier, solar energy, geothermal energy.

(RESEARCH PROGRAMS)

ST77 10088 INTERSOCIETY ENERGY CONVERSION ENGINEERING CONFERENCE, 10TH, PROCEEDINGS, PART 2: INDEX-ABSTRACTS, 1976

Anon, (IEEE, New York, NY), Intersoc Energy Convers Eng Conf, 10th, Proc, Pt 2: Index-Abstr, Publ by IEEE, New York, NY, p. 268, 1976

The contents of this volume are divided into four sections: Abstracts, Subject Index, Author Index, and Addendum to the Record of the Tenth IECEC. The Abstracts Section includes the 1972, 1973, 1974, and 1975 papers in ascending numerical order. The Subject and Author Index Sections include the papers published in the 1971 (6th) through 1975 (10th) Intersociety Energy Conversion Engineering Conference Proceedings. The Addendum contains 16 papers not received in time to be included in the RECORD. Topics dealt with in these papers include: solar sterilization of medical instruments, alternate fuels, fuel cells, wind system applications, thermoelectric heat engines, photovoltaic conversion, lithium batteries, heat pipe applications, biomedical power, and energy storage and components.

(WIND)

ST77 10089 PROCEEDINGS OF THE REGIONAL PROFESSIONAL ENERGY SEMINAR

(Vermont Energy Resources, Waltsfield), 434 p., 1976, CONF-7509143

Andrew B. Shapiro, President of Vermont Energy Resources, presented the opening remarks at the seminar followed by some announcements by Mr. Andy Greenfield. The presentations by Robert Mitchell, Paul London, Herbert Chabot, and Dr. Warren H. Donelly reviewed some economic, legal, and environmental aspects of energy. The luncheon speaker, John P. Eberhard, AIA, spoke on "An Architectural View of Energy Conservation." Governor Thomas P. Salmon opened the next session with some comments on energy followed by presentations by State Energy officers from Vermont, New Hampshire, and Maine. Rhett Turnipseed, ERDA, and Robert Philpott, FEA, presented additional energy information. E.B. Walker, Vermont Department of Forests and Parks, spoke on "Benefit to Forest of Large-Scale Use of Wood as Energy Source." Professor Edward Huff, Univeristy of Maine, addressed the group on "Wood Chip Combustion." F.M. Laing, University of Vermont, spoke on "Wood Chip Combustion in Sugaring Process." Other papers included Total Chip Harvesting by David White; Wood Gas Burner, John Calhoun; Explanation of ERDA's Energy Simulator, Peter Balch; Private vs. Governmental Financing for New Energy Systems, George Erb; What Can Be Done in the Meantime, Arthur G. Atkinson; and some building hints by Gerard Snyder, AIA. Four additional papers are The Conversion of Low-Temperature Heat into Electricity from Any Waste Heat Source, George Erb; Solar Collection and Heat Storage in Buildings, Bruce Anderson; a review paper on wind power, David Sellers; and High-Efficiency Wood-Burning Stove, Duncan Syme. Two rather lengthy reports are included in these proceedings: (1) the State of Vermont's report "Governor's Task Force on Wood as a Source of Energy"; and (2) "The Feasibility of Generating Electricity in the State of Vermont Using Wood As a Fuel", by J. Phillip Rich and Peter H. Bauer of J.P.R. Associates, Inc., Stowe, VT.

(ECONOMIC, LEGAL, ENVIRONMENTAL ASPECTS, WOOD-ENERGY)

ST77 10090 REPORT OF THE NATIONAL RESEARCH COUNCIL COMMITTEE ON NUCLEAR AND ALTERNATIVE ENERGY SYSTEMS

(National Academy of Sciences - National Research Council, Washington, DC), 60 p., EX-76-C-10-3784, PB-263595/1, N77-24633
Avail:NTIS

The nation's energy future was studied with special consideration of the role of nuclear power in the context of alternative energy systems. Appropriate roles of nuclear and alternative energy systems in the nation's energy future, with a focus on the period between 1985 and 2010, are described. Energy conservation and demand, supply and delivery systems, risks and impacts of various delivery and end-use systems, and alternative future energy scenarios are considered.

(CONFERENCES, ENERGY-POLICY)

ST77 10091 REVISION OF THE R AND D PROGRAMME OF THE EUROPEAN COMMUNITIES IN THE FIELD OF ENERGY (PROJECT ADVANCEMENT). INDIRECT ACTIONS. R AND D PROGRAMME IN THE FIELD OF ENERGY

Technol.-NACHR. Manage.-Inf., V 202:A-C, 1976, EDB-77:054772, In German

This is a survey of the program with the following activities: energy conservation/ production and utilization of hydrogen/ solar energy/ geothermal energy, and systems analysis: drawing-up of models.

(RESEARCH-PROGRAMS)

ST77 10092 SELECTED PAPERS FROM A CONFERENCE ENTITLED FOCUSING ON ENERGY, JANUARY 22-23, 1976

(Kentucky Univ., Lexington, KY), 32 p., Dec 1976, IMMR24-M3-76, PB-263 800/5WE
Contents: Design with climate; ERDA program for solar heating and cooling of buildings; Physical plant maintenance and operations at the University of Minnesota; More insulation can increase energy consumption; Computer energy analysis for existing buildings; Exploding some myths about building energy use.

(CLIMATE, COMPUTER ANALYSIS)

ST77 10093 STUDY OF ELECTRICAL ENERGY USAGE IN THE PUBLIC SERVICE ELECTRIC AND GAS CO., SERVICE TERRITORY, STATE OF NEW JERSEY PREPARED FOR THE DEPARTMENT OF THE PUBLIC ADVOCATE, DIVISION OF RATE COUNSEL FINAL REPORT

(Dubin-Bloome Associates, P.C., New York, NY), 1976, EDB-77:036206
In January 1976, the PSE and G Co. applied for a rate increase of 25 percent for all electric and gas service. Justification was based mainly on a load forecast indicating electrical energy demand would increase about 4.1 percent per year over the next 15 years. The New Jersey Department of Public Advocate, Division of Rate Council questioned the necessity for building the new plants required, thereby questioning the necessity for raising the needed capital and consequently the necessity for this rate increase. Dubin-Bloome Associates were requested to investigate two questions: (A) Is the load forecast submitted by the utility as justification for their generating plant construction program "correct?" and (B) What alternatives exist that could modify the need for constructing these generating plants? In order to evaluate the utility's load forecast, Dubin-Bloome Associates prepared an independent load forecast based upon a "business as usual" set of assumptions. In order to determine the effectiveness of certain alternatives, additional forecasts assuming a concerted energy conservation program, wide-scale use of solar energy and intensive use of total energy and co-generation plants were prepared.

(ENERGY CONSERVATION, REGULATIONS)

ST77 10094 STUDY OF EXISTING ENERGY USAGE ON LONG ISLAND AND THE IMPACT OF ENERGY CONSERVATION, SOLAR ENERGY, TOTAL ENERGY AND WIND SYSTEMS ON FUTURE REQUIREMENTS

(Dubin-Mindell-Bloome Associates, New York, NY), Oct 31, 1975, NP-21425, EDB-77:054491
In 1974, the Long Island Lighting Company (LILCO) submitted an application requesting permission to construct two new nuclear power plants at LILCO's Jamesport Site in Suffolk County, New York. LILCO's current plans call for completion of Jamesport unit 1 in 1982, with Jamesport unit 2 in operation by 1984. At the present time, LILCO is constructing a 820-mW nuclear-powered plant at its Shoreham site in the town of Brookhaven, about twelve miles west of the proposed Jamesport reactors. The initiation of the study is a direct response by Suffolk County to explore two fundamental questions: (1) Will additional central-generating capacity, totaling 2300 mW be needed on Long Island from 1982 and 1984 after the Shoreham plant is built, as LILCO has concluded? (2) Even if energy requirements were to grow beyond LILCO's installed and firm capacity after Shoreham is built, is the construction of additional nuclear-powered central-generating plants the only practical way to provide for future needs, as LILCO has also concluded? To answer these basic questions, the Suffolk County Department of Environmental Control commissioned Dubin-Mindell-Bloome Associates, P.C., in February of 1975 to assess the energy forecast upon which LILCO has based its planning for future facilities and to prepare alternative estimates of electrical power requirements for 1975 to 1995. In addition, DMBA was commissioned to identify and quantify the potential reduction in peak loads and savings in annual electrical energy consumption by alternative means of meeting future requirements - other than by the construction of new nuclear central generating plants, or other than systems which if substituted for nuclear power plants, would simply result in the consumption of more fossil fuels. The results of the assessment are presented.

(FEASIBILITY-STUDIES, REGIONAL-ANALYSIS)

ST77 10095 WORKING SESSIONS PRESENTED AT CONVENTION OF THE UPADI (PANAMERICAN UNION OF ENGINEERING ASSOCIATIONS), 14th, 1976

Anon, (Union Panam de Asoc de Ing, Montevideo, Uruguay), Trab Apresentados a Conv da UPADI (Union Panam de Asoc de Ing), 14th, Rio de Janeiro, Brazil, Oct 3-8, 1976, Publ by Fed Bras de Assoc de Ehg, Brazil, V 4:1444, 1976, In English, Spanish and Portuguese
Proceedings includes 56 papers covering a variety of problems in the following engineering fields: food engineering; economic and information engineering; environmental engineering; residential engineering; industrial engineering and energy resources; contribution of industrial engineering and energy resources to the integrated development in the countries of the Americas; engineering and the governmental decisions; and human engineering.

(ENERGY CONSERVATION)

ST77 10096 REPORT OF THE ELECTROLYTIC INDUSTRIES FOR THE YEAR 1975

Argade, S.D., Leitz, F.B., (Basf Wyandotte Corp., MI), J. Electrochem. Soc., V 124:12C-29C, N1, Jan 1977, EDB-77:061596

Data are presented on energy resources and electric power generation in the U.S. the need for Federal programs to achieve less dependence on imported petroleum, the role of fossil-fuel, hydro, and nuclear power plants in power generation, and the outlook for power from solid waste combustion, geothermal resources and solar energy are discussed.

(ECONOMICS, ENERGY-SOURCES)

ST77 10097 NUCLEAR POWER, COAL AND ENERGY CONSERVATION SPECIAL REPORT

Auer, P.L., Manne, A.S., Yu, O.S., (Electric Power Research Inst., Palo Alto, CA), Mar 1976, PB-251262, EDB-77:036114

A programming model is used to explore options by which the U.S. may realistically move from its dependence on oil and gas to a more diversified energy economy based on nuclear power and/or coal. Supply options considered are: direct combustion of coal; conversion of coal to synthetic fuels; petroleum, natural gas and oil shale resources; nuclear energy from light water and fast breeder reactors; hydrogen via electrolysis; solar power; and fusion.

(ENERGY-POLICY, MATHEMATICAL MODELS)

ST77 10098 ACCIDENTS AND UNSCHEDULED EVENTS ASSOCIATED WITH NON-NUCLEAR ENERGY RESOURCES AND TECHNOLOGY

Bliss, C., Clifford, P., Goldgraben, G., Graf-Webster, E., Krickenberger, K., (MITRE Corp., McLean, VA), 293 p., Feb 1977, M76-68, EPA/600/7-77/016, PB-265 398/8WE

Accidents and unscheduled events associated with non-nuclear energy resources and technology are identified for each step in the energy cycle. Both natural and anthropogenic causes of accidents or unscheduled events are considered. Data concerning these accidents are summarized. Estimates of frequency and severity are presented for all accidents. The energy systems discussed are coal, oil, natural gas, LNG, hydroelectric, geothermal, oil shale and solar energy.

ST77 10099 ELECTRICITY SUPPLY INDUSTRY: YESTERDAY, TODAY AND TOMORROW

Booth, E.S., Proc. Inst. Electr. Eng. (London), V 124:1-16, N1, Jan 1977, EDB-77:060903

The engineering aspects of the electricity supply industry in the past, present and future are discussed. The first part considers the immediate prewar years when electricity was supplied by widely varying undertakings. Aspects of generation, transmission distribution and utilization are considered in turn and comparisons are made with the present day where appropriate. The second section deals with topics which are of major importance and interest today with a brief historical development being given where relevant. Particular attention is afforded to the supergrid, the large generating sets, nuclear power, the explosion in light-current engineering techniques and equipment and to the needs of the customer and his uses for electricity. In the final part, an attempt is made to look into the future. After considering the prospects for electricity sales and the availability of various forms of energy, a review and assessment are made of the electricity-generation options open to the industry. The possibilities for the transmission and distribution of this energy are then discussed, and the uses to which electricity might be put are briefly reviewed.

(UNITED-KINGDOM, WIND, ECONOMICS)

ST77 10100 ENERGY SITUATION IN NEW ENGLAND

Brainard, J.P., Munson, J.S., Palmedo, P.F., (Brookhaven National Lab., Upton, NY), Nov 1976, BNL-50580, EDB-77:054834

This briefing book is designed to give a concise overview of the facts of the energy situation in New England and of attitudes within the region towards current energy issues. Many of the central problems of U.S. energy policy are manifested in the region in a magnified form. The region entered the period of energy shortages and increasing prices in an economically declining condition. Manufacturing activity and jobs were being lost to other regions of the country and personal income was increasing at significantly slower rates. Energy prices were already high in 1970, 30 percent higher than the rest of the country. The difference would increase to 38 percent by 1974. With essentially no indigenous energy resources, New England is an energy-importing region/ over 60 percent of the fuels it consumes is imported from abroad. Although the future supply of energy to the region is critically dependant on energy resource policies, policies related for example to coal and oil shale development, the region's concerns cluster around policies and technologies and are perceived to have a more direct impact on its energy welfare. Thus, energy conservation, solar energy, nuclear power, offshore oil development and in general, the price of energy to the region are paramount issues of concern and debate. A New England energy policy is discussed in an appendix.

(ECONOMICS, ENERGY-CONSERVATION, ENERGY-POLICY, ENERGY-SOURCES, ENVIRONMENTAL-EFFECTS)

ST77 10101 POWER FOR POLYMERS

Bushman, E.F., (Plast Eng, Laguna Beach, CA), SPE Annu Pac Tech Conf (PACTEC '76), 2nd; Spec Plast Educ, Seattle, WA, Aug 10-12, 1976, Sponsored by SPE, West Sect, Greenwich, CT, p. 243-262, 18 refs, 1976

A review of energy resources is followed by an analysis of the energy utilization and conservation in polymer and plastics industries. The subject is discussed under headings - introduction; new sources of energy; old King coal; coal-o-chemicals; a solar flair; deep heat; polymers powered by the wind; energy data; energy of polymerization; heating and cooling of molds; conclusion. Statistical data related to the use of energy by polymer and plastics processing industries are included.

(PLASTICS INDUSTRY, MANUFACTURE, CONSERVATION)

ST77 10102 MONTANA ENERGY POSITION PAPER: A MONTANA ENERGY ADVISORY COUNCIL STAFF REPORT

Clack, T.H. Jr., (Montana Energy Advisory Council, Helena, MT), June 1976, NP-21224, EDB-77: 036133

The paper was written in an attempt to begin the analysis of the energy issue that must precede formulation of policy. Montana, underlain by immense quantities of easily strippable, low-sulfur coal, is perceived as a source of fuel by a highly energy-consumptive and energy-dependent nation. Montana is confronted by an immediate shortage of natural gas. The techniques by which the coal is to be developed and converted to more usable forms of energy and the side effects associated with these techniques, are potentially destructive of essential social, economic and natural systems. Technologies to develop these energy sources have not been studied, but plans are being made to develop the energy sources, perhaps on site. Data and a brief discussion of Montana's energy reserves, production and consumption are presented in Chapter II. Two projections of energy development are presented in Chapter III. Constraints on energy development in Montana--natural resource constraints, capital constraints, manpower constraints, market concerns, technological constraints, policy and law, and public deman and attitudes--are discussed in Chapter IV. Chapter V identifies the range of energy sources and technological alternatives available for consideration by Montana. Chapter VI provides an introduction to some major effects of energy industrialization in Montana. Chapter VII discusses some vital and unanswered questions regarding energy development. These discussions address resource allocation, the Montana life style, the role of the public in determining Montana energy policy, the role of state government in determining energy development, and the nature and duration of energy resource development. The final chapter suggests the need for a formal state energy policy, what that policy should address, and how it can be developed.

(ECOLOGY, ENERGY-CONSERVATION, ENERGY-POLICY, ENERGY-SOURCE, ENVIRONMENTAL-EFFECTS, GOVERNMENT-POLICIES, LAW, SOCIO-ECONOMIC-FACTORS, WIND)

ST77 10103 CONSERVING ENERGY AT SHORE FACILITIES

Clark, M.E., (US Coast Guard, Washington, DC), Mil Eng., V69:20-23, N447, Jan-Feb 1977

Energy surveys are presented. Topics discussed include over-all policy, facilities engineering philosophy, facilities engineering policy, accomplishments in conservation, infrared thermography, and solar energy conversion.

(MILITARY, ENERGY-CONSERVATION, ENERGY POLICY)

ST77 10104 ENERGY AND LAND POLICIES

Daniel, G.H., (University Coll. of Wales, Aberystwyth, Australia), J. Inst. Fuel, V49:115-122, N400, Sept 1976, EDB-77:054868

The author cites the scenario when the coal industry was developed due to shortages of wood/the development of synthetic chemicals began when difficulties arose to provide cheap and abundant supplies of foot, timber, wool, cotton, oils, fats, rubber and alcohol. He then poses the question: should energy and land use policies continue in line with this historical trend, and in the expectation that the energy industries will be able to meet the world's demands for fuel and power, while the land-use industries concentrate on seeking to meet the demands for food and natural materials/or should an attempt be made to reverse the historical process and seek to develop the land-use industries so that they can offset the production deficiencies of the energy industries. The first alternative is discussed in relation to the needs of the United Kingdom. The issues are examined in relation to the future extending over the next 40 years or so. The interrelationships of energy and land-use policies are considered with the adequacy of present energy policies in view and the land-use implications of conventional fuel shortages and the possibilities of increased use of solar energy.

(ENERGY-CONSERVATION, ENERGY POLICY, REGULATIONS, UNITED-KINGDOM)

ST77 10105 POTENTIAL OF NATURAL ENERGY SOURCES

Denton, J.D., Glanville, R., Gliddon, B.J., Harrison, P.L., Hotchkiss, R.C., Hughes, E.M., Swift-Hook, D.T., Wright, J.K., (Central Electricity Generating Board, London, England), 1976, CEGB, Press and Publicity Office, Sudbury House, 15 Newgate St., London, England, EC1A 7AU, EDB-77:036217

Apart from fossil fuels and nuclear energy, five main alternative sources of power for electricity generation are: the sun, the wind, the waves, the tides and the heat inside the earth. Each has been examined for its relevance to the energy situation in Britain and in particular to the CEGB's requirements as an electrical utility. None emerges from the analysis as directly competitive with nuclear power, provided that nuclear fulfills present expectations. As an insurance against unforeseen delays in the nuclear program, however, one or two of the

options may well be worth closer consideration, particularly wave power, for which Britain is favorably placed. The best immediate prospect for using solar energy falls outside the province of the CEGB, in the area of domestic water heating. Wind power, despite the windiness of the British Isles, suffers in practice from a low load factor, which would greatly inflate the capital cost. Geothermal power in Britain, geologically one of the most stable parts of the world, appears to be available only at depths too great to be presently attractive for electricity generation. Finally, tidal power, although technically available in limited amounts, again suffers from high capital costs.

(COMPARATIVE-EVALUATIONS, ECONOMICS, FEASIBILITY STUDIES, TIDAL-POWER, UNITED-KINGDOM, WAVE-POWER, WIND, BIOMASS)

ST77 10106 PRESENT SOLUTIONS AND FUTURE PROSPECTS FOR THE POWER SUPPLY OF SELF-CONTAINED TELECOMMUNICATION STATIONS

Desfrasnes, J.P., Rev. Gen. Electr., V85:510-520, N6, June 1976, EDB-77:054969, In French

The data concerning the delicate problem raised by isolated or remote plants on power distribution networks are recalled and the present conventional solutions, i.e.; cells, batteries, thermoelectric generators, closed-loop operated turbo-generators and generating sets are first considered. New solutions are then discussed. Among them, more particularly, the stress is laid on aerogenerators and photovoltaic (solar) cells. Future prospects open to new solutions and the corresponding pilot developments are considered in conclusion

(COMPARATIVE-EVALUATIONS, WIND, PHOTOVOLTAICS)

ST77 10107 HAWAII TECHNOLOGY UTILIZATION EXPERIMENT

Dorn, D.W., Miller, C.F., (California Univ., Livermore, CA), Dec 8, 1976, UCID-17343, EDB-77:054669
NTIS $4.00

A one-year technology-transfer project involving ERDA installations and Hawaii consisted of sending teams from the Lawrence Livermore Laboratory on week-long field trips every two months to test the effectiveness of direct methods of transferring technology information from Federal sources to civilian clients. The team was questioned primarily on non-energy matters and the energy questions asked related mostly to individuals or small industries. The team responded to all questions and found that a wide range of knowledge was more effective than having a sequence of experts. Hawaiians considered current major ERDA projects to be irrelevant to their needs. The team was most successful on a one-to-one basis because large groups and state agencies tend to be more policy-than action-oriented. Personal followup was considered essential. The team also learned that their visits generated ten times as many inquiries as were received unsolicited by the laboratory. Most inquiries involved biomass and use of agricultural wastes, solar energy, and transportation. An important contribution of the team's workshops was linking groups to work together on common problems. An appendix lists the subjects of queries and the names and addresses of consortium participants and hawaiian contracts.

(BIOMASS, ENERGY-SOURCES, TECHNOLOGY-TRANSFER)

ST77 10108 ANALYSIS OF ENERGY USAGE ON LONG ISLAND FROM 1975 TO 1995: THE OPPORTUNITIES TO REDUCE PEAK ELECTRICAL DEMANDS AND ENERGY CONSUMPTION BY ENERGY CONSERVATION, SOLAR ENERGY, WIND ENERGY AND TOTAL ENERGY SYSTEMS

Dubin, F.S., (Dubin-Mindell-Bloome Associates, New York, NY), 1976, NP-21332, EDB-77:049850

The Long Island Lighting Company (LILCO) serves Long Island and a small section of Queens, New York, with electricity and gas. The company has under construction one nuclear-powered, 830-MW electric generating plant, the Shoreham, scheduled to come on-line late in 1978/ in addition, LILCO has made application to construct two new nuclear plants in the town of Riverhead in Suffolk County, Long Island/Jamesport I and Jamesport II, each with a capacity of 1150 MW are planned to come on-line in 1982 and 1984, respectively. LILCO's justification for these two new plants is based on the system required to meet the loads which, according to their forecasts, will occur during the period 1975-1995. The projection of the peak electric demand and the yearly consumption of electricity and the method of forecasting (exponential smoothing analysis) by LILCO are analyzed. An intensive energy conservation program coupled with a modest solar energy system for domestic hot water and space heating and cooling is shown to have the potential of reducing the normal loads to the extent that not only could the Jamesport I and II plants be cancelled, but also that the completion of the shoreham plant could be delayed. The potential of the wind energy available over Long Island is shown to exceed all of its energy requirements for the next twenty years. On-site total energy system and the use of solid waste for fuel are cited as two additional measures to further reduce the need for raw source energy (fossil fuel or nuclear), for central electric generating plants.

(DEMAND-FACTORS, ENERGY-CONSERVATION, NEW-YORK)

ST77 10109 EFFICIENT ENERGY UTILIZATION

Ebersbach, K.F., Layer, G., (Forschungsstelle Fuer Energiewirtschaft, Munich, West Germany), Brennstoff-Waerme-Draft, V29:149-151, Apr 1977, A77-31578, In German

A description is presented of investigations which have been conducted in West Germany with the objective to explore possibilities concerning a saving of energy by various approaches. Attention is given to the improvement of the efficiency of energetic process, the reduction of the energy intensity in the case of household devices, the heating systems, the utilization of solar energy for heating and hot-water supply applications, and approaches to save fuel in motor-vehicle operation.

(ENERGY-TECHNOLOGY, HEAT-PUMPS, GERMANY, ENERGY-CONSERVATION)

ST77 10110 NUCLEAR POWER IN IRELAND AND THE ALTERNATIVES

Flanagan, V., (Electricity Supply Board, Ireland), Pergamon Press, Oxford, O'Mongain, E., O'Toole, C.P., 1976, EDB-77:061019

Some of the factors specific to the introduction of nuclear power in Ireland are described. The need to diversify from imported oil is discussed and the possible role of other options such as increased utilization of conventional energy, the development of renewable energy sources (wind, solar and tidal) and energy conservation.

(ENERGY POLICY, TIDAL-POWER, WIND)

ST77 10111 ELECTRICITY AND THE ENERGY "GAP"

Greiner, P.C., (Edison Electric Institute, New York, NY), ASHRAE Journal, V19:30-32, Mar 1977, A77-27890

The paper gives a brief summary of some of the main projects being organized and carried out by electric utility companies across the U.S. for investigating the potential of solar energy, geothermal energy, wind power and fusion power as energy sources of the future. The aims of the Edison Electric Institute conservation and energy management efforts are outlined. The excess energy analysis computer-program is mentioned, which is a computerized method for comparing the energy requirements of a building using alternate mechanical/electrical systems. It allows the designer to compare total building energy usage and demand for each such system, using any combination of available energy sources.

(COMPUTER-PROGRAM, WIND, ENERGY-TECHNOLOGY, ENERGY-CONSERVATION)

ST77 10112 A DIRECTORY OF COMPUTER SOFTWARE APPLICATIONS ENERGY

Grooms, D.W., (NTIS, Springfield, VA), 75 p., Apr 1977, PB-264 200/7WE

The computer programs or the computer program documentation which are cited in this directory have been developed for a variety of applications in the field of energy. The cited computer software includes applications in solar energy, petroleum resources, batteries, electrohydrodynamic generators, magnetohydrodynamic generators, natural gas, nuclear fission, nuclear fusion, hydroelectric power production and geothermal energy. The computer software cited has been used for simulation and modeling, calculations of future energy requirements, calculations of energy conservation measures, and computations of economic considerations of energy systems.

(COMPUTER PROGRAMS, SIMULATION, MODELING, ENERGY-CONSERVATION, ECONOMIC)

ST77 10113 FORECAST OF LIKELY U.S. ENERGY SUPPLY/DEMAND BALANCES FOR 1985 AND 2000, AND IMPLICATIONS FOR U.S. ENERGY POLICY

Gustaferro, J.F., Maher, M., Wing, R., (Domestic and International Business Administration, Washington, DC), 174 p., Jan 20, 1977, DIBA/EAD-77/1, PB-266 240/1WE

This report projects future U.S. energy balances based on a 1.2% per capita energy growth rate. These balances take into account declining U.S. and world oil and gas reserves and limitations on fuel substitutability.

(1.2%-PER-CAPITA-ENERGY-GROWTH-RATE)

ST77 10114 CIRCUM-PACIFIC ENERGY AND MINERAL RESOURCES

Halbouty, M.T., Ed., Maher, J.C., Ed., Lain, H.M., Ed., Pap from the Circum-Pac Energy and Miner Resour Conf, Honolulu, Hawaii, Aug 26-30, 1974, Publ by Am Assoc of Pet Geol (Mem 25), Tulsa, OK, 608 p., 1976

One hundred twenty-six papers presented by authors from 16 countries are published in whole or in part in this volume. The papers include subjects in geology and geophysical research; exploration and development of oil, gas, and coal and of geothermal, solar and nuclear energy; exploration and development of ferrous and nonferrous metallic minera.

ST77 10115 EPA RESEARCH IN EMERGING POWER TECHNOLOGY

Hartley, R.P., Bostian, H.E., (Environmental Protection Agency, Washington, DC), Proceedings of National Conference on Health, Environmental Effects and Control Technology of Energy Use, 1976, EPA-600/7-76-002, EDB-77:054727

The paper briefly reviews the principal new concepts in fuel conversion efficiency in electric power generation and solar and geothermal energy and their potential environmental problems. A discussion follows of the EPA research program now being initiated. Results indicate that generation of "conventional" pollutants will be less due to increased conversion efficiency and improved combustion and waste treatment technology, but problems with wastes from geothermal energy may be very severe. Solar energy conversion may have other adverse environmental impacts.

(ENERGY-CONSERVATION, ENVIRONMENTAL-IMPACTS, POLLUTION, RESEARCH-PROGRAMS)

ST77 10116 THE CASE FOR ALTERNATIVE ENERGY SOURCES

Hartnett, J.P., (Illinois, University, Chicago, IL), In Alternative Energy Sources, p. 19-38, 1976, Academic Press, Inc., New York, NY, Hemisphere Publishing Corp., Washington, DC, A77-31467 13-44, A77-31469

World energy consumption patterns are examined and the fuels used for energy during the time from 1950 to 1970 are considered. An investigation is conducted regarding the distribution of energy resources, taking into account reserves of natural gas and oil, coal resources, heat resources, oil shale and bituminous sands, uranium reserves, hydro resources, geothermal resources, solar energy, tidal power, wind power and ocean thermal gradients. Attention is also given to postembargo energy projections and the energy program in the U.S.

(ECONOMIC, TIDEPOWER, WIND, OCEAN ΔT)

ST77 10117 ALTERNATIVE ENERGY SOURCES BOOK

Hartnett, J.P., (Illinois, University, Chicago, IL), 335 p., 1976, Academic Press, Inc., New York, NY, Hemisphere Publishing Corp., Washington, DC, For Individual Items See A77-31468 to A77-31475, A77-31467

The place and role of various energy resources in energetics of the future is considered along with the case for alternative energy sources, energy development and related UNESCO activities, applications of fluidized beds in coal technology, coal gasification, and solar-thermal energy systems. Attention is also given to the French CNRS 1000 kW solar furnace, solar-thermal power systems, heat and mass transfer in the earth, and the present and future of geothermal power utilization.

(ENERGY-TECHNOLOGY, FURNACES, STORAGE)

ST77 10118 ENERGY FUTURES: INDUSTRY AND THE NEW TECHNOLOGIES

Herman, S.W., Cannon, J.S., (Inform, Inc., New York, NY), 1976, EDB-77:036147

A separate abstract was prepared for each of the three sections of the book, under which seventeen separate technological applications are treated.

(BOOK, SOLAR-CELLS, HEATING, TECHNOLOGY-ASSESSMENT, WIND, OCEAN ΔT, THERMAL POWER)

ST77 10119 INEXHAUSTIBLE RESOURCES

Herman, S.W., Cannon, J.S., (Inform, Inc., New York, NY), 1976, Energy Futures: Industry and the New Technologies, EDB-77:049869

This section, section I, summarizes information on nondepletable resources of solar heating and cooling, solar cells, solar thermal electric conversion, ocean thermal electric conversion, wind generators, nuclear fusion and hydrogen production. Each of the seven chapters consists of two parts-an overview or general introduction to the status of the technology, followed by from 3 to 34 individual profiles of companies' projects in the technology. The overview summarizes data on the technology, the environmental impact, the history, obstacles to commercialization, Federal and private programs, and a brief prognosis of the technology's future.

(GOVERNMENT POLICIES, HEATING, THERMAL-POWER, WIND, TECHNOLOGY-ASSESSMENT)

ST77 10120 CURRENT PROBLEMS IN ENERGY DEVELOPMENT AND ENERGY SCIENCES

Homola, F., Energetika (Prague), V27:62-69, Feb 1977, A77-27882, In Czech

A qualitative survey is presented of worldwide energy problems and opportunities, acknowledging current emphasis on electrical energy as the most universal and most versatile form of usable energy. A brief historical overview and promotion of cybernetics is followed by comparisons of forms of energy sources and energy production in recent decades, with attention to more recent ecological concerns. The finiteness of energy resources, exponentially growing energy demands, and new methods of energy production and energy conversion are outlined; nuclear fission power, thermonuclear fusion research, geothermal heat, utilization of thermal differentials, solar energy, wind power, hydroelectric power, reflection of solar energy via microwaves from satellite orbit and combustion of wastes are mentioned. Selection of appropriate voltage levels for international power grids is discussed.

(ECONOMIC, ENERGY-WORLDWIDE, CYBERNETICS, WIND)

ST77 10121 WHICH UTILIZABLE ENERGY SOURCES ARE AVAILABLE FOR US DURING THE NEXT FEW DECADES

Huebner, R., (German Federal Republic), Ind.-Elektr. Elektron., V20:435-437, N22, 1975, EDB-77:043280

This is the second part of an article the first part of which appeared in IEE 7,1975, p. 122-124. The present contribution deals with: A) Glacier power plants and an optimistic way of looking at their relizability, B) Geothermal power stations, C) Utilization of solar energy and D) The principles and the present state of technology concerning fuel cells. This is followed by a brief description of energy conservation measures which refer to new buildings, electrical equipment, to bulk consumers, the producers and to traffic.

(ENERGY-CONSERVATION, GERMANY, THERMAL-POWER)

ST77 10122 POTENTIAL ENERGY AN ANALYSIS OF WORLD ENERGY TECHNOLOGY BOOK

Kenward, M., 236 p., 1976, Cambridge University Press, Cambridge and New York, A77-31825 PC $14.95

General conditions concerning the available energy sources for the world's economy are examined, taking into account the growth in world energy consumption over the period from 1962 to 1972. New uses of coal are considered along with aspects of gasification and liquefaction. Prospects concerning a use of nuclear fission are investigated, taking into account thermal reactors, breeder reactors, the fuel cycle, waste management, reactor safety, nuclear process heat, and fuel transformations. Attention is also given to oil resources, oil shales, tar sands, fusion, solar power, geothermal energy, wind power, the utilization of the tides, and questions related to an efficient use of available fuels.

(ENERGY POLICY, TIDEPOWER, WIND, THERMAL-POWER)

ST77 10123 FACTORS IN THE PLANNING OF A NATIONAL INFORMATION SYSTEM FOR RENEWABLE ENERGY FINAL REPORT

Kuipers, J.W., Thorpe, R.W., Lancaster, F.W., (QEI, Inc., Bedford, MA), 224 p., PB-262003/7 Rept-6930, NSF SIS-75-12766, N77-24002
Avail:NTIS

A national information system for the renewable energy field is proposed. The system is intended to serve the scientific and technical communities as well as the management, technology, industrial, policy making, and the general public components of the energy field. It is proposed that in order to achieve improvements in communication between information communities and within communities, a system be set up which comprises a distributed network of satellite centers with a coordinating headquarters center. Satellite centers in the system consist of information resource and analysis centers (IRACS) for particular information areas. IRACS are to be designated for each defined information area in the energy fields of interest and are to be responsible for acquiring, organizing and maintaining all information of interest in a given area.

(ENERGY-TECHNOLOGY, WIND)

ST77 10124 NATIONAL PROGRAM FOR ENERGY INVESTIGATION 1976

Lindhout, A.H., (Stichting Reactor Centrum Nederland, The Haque, Danmark), Atoomenerg. Haar Toepass, V18:232-238, N9, Sept 1976, EDB-77:036060, In Dutch

An estimate of (Dutch) energy requirements up to the year 2000 shows an overall increase of about 40 percent, then a levelling off. The contribution from imported coal will increase, and after 1990 there will be a small amount from solar and wind energy. Atomic energy will continue to increase, but will account for at most 20 percent of the total. Natural gas and oil will reach peaks and then decline. A considerable amount of materials must be imported. Development is continuing on fast uranium-plutonium reactors thermal uranium-thorium reactors, and nuclear fusion. Coal and natural gas are being processed before use (e.g. transformed into hydrogen and methanol respectively).

(ENERGY POLICY, NETHERLANDS, WIND)

ST77 10125 ALTERNATIVE ENERGY SYSTEMS. A GENERAL SUMMARY

Lloyd, T., Pet Rev, V 31:7,9-10, N361, Jan 1977

Alternative energy systems are defined as low impact technologies and/or renewable resource technologies. Examples of the first include domestic roof-mounted solar panels, organic waste digester methane production, heat pumps, wind generators and small-scale hydrogenerators. The latter - renewable resources - include solar, wind, wave, tidal and hydro power plus certain forms of replaceable power. Prospects for alternate energy system development are reviewed within the context of a brief review of such systems.

(ENERGY-CONSERVATION, TIDAL-POWER, WIND, WAVE)

ST77 10126 IGT 1975-1976: OVERVIEW

Lofstrom, J.R., (Institute of Gas Technology, Chicago, IL), Research, Energy Economics, Policy Studies, Education, and Information Services, 1976, Inst. of Gas Tech., Chicago, IL, NP-21316, EDB-77:053376

The Institute of Gas Technology conducts a broad range of energy related programs of research, economics, planning, and education for industry and government sponsors. Its staff consists of experts in diverse scientific, engineering, and business disciplines. IGT takes an active role helping shape national energy policies along with the technical problems. Coal gasification, coal conversion to clean liquid fuels and synthesis gas for ammonia or methanol production, oil shale conversion, waste conversion, solar energy, fuel cells, hydrogen energy systems, ocean thermal and wind energy, gas purification, and distribution equipment research are some of their programs briefly described. Their research on efficient, nonpolluting use of energy in homes, commercial buildings and industry is cited.

(ECONOMICS, ENERGY-CONSERVATION, ENERGY POLICY, ENVIRONMENTAL-EFFECTS, HYDROGEN-BASED-ECONOMY, RESEARCH-PROGRAMS)

ST77 10127 ENERGY IN PERSPECTIVE: AN ORIENTATION CONFERENCE FOR EDUCATORS

McKlveen, J.W., (Arizona State Univ., Tempe, AZ), 422 p., 1976, CONF-760677, Microfiche copies only

An awareness of energy and the pertinent economic, environmental, and risk/benefit consideration must be presented to the public. A logical beginning point is in the classroom, through knowledgeable and motivated educators. Ms. Carolyn Warner, Superintendent of Public Instruction, State of Arizona, presented the first paper, Energy and the Educator. Papers on all aspects of energy were presented at the confarence by experts from throughout the United States. The papers were: Energy Resources: World and U.S.A.; Coal Technology: Mining, Energy Generation, Wastes, and Environmental Considerations; Energy Conservation; Arizona's Energy Resources and Development; Gas and Oil: Natural Gas, S.N.G., Oil, Oil Shale, and Tar Sands; Geothermal Energy Perspective; Solar Energy; Solar Technology; Natural Radiation Environment; Fission Theory; Arizona's Palo Verde Nuclear Generation Complex; Gas Cooled Reactors, Liquid Metal Reactors and Alternatives; Radioactive Wastes: Disposal Alternatives; Reactor Safety; Nuclear Safeguards; Fusion Power; Genetic and Somatic Radiation Effects; Energy Economics; Religion, Philosophy, and Energy; Nuclear Studies in Fine Arts and Archeology; Nuclear Methods Applied to Agriculture and Food Preservation; Nuclear Methods in Criminology; Environmental Impact of Energy Generation; and Risk and Insurance Consideration - Energy for Tomorrow. The tours to energy installations conducted during the conference and demonstration related to energy are cited.

(ECONOMIC, ARIZONA, ENVIRONMENTAL-CONSIDERATIONS, ENERGY-CONSERVATION)

ST77 10128 UNITED STATES OPTIONS FOR A TRANSITION FROM OIL AND GAS TO SYNTHETIC FUELS

Manne, A.S., (Harvard Univ., Cambridge, MA), In Miami Univ. First World Hydrogen Energy Conf. Proc., V 3:8, See N77-21626 12-44, N77-21661
Avail:NTIS

Some of the options by which the U.S. may move away from its present heavy dependence upon oil and gas toward a more diversified energy economy are discussed. Through nonlinear programming, the model incorporates both own- and cross-price elasticities of demand. In this way, it allows for price-induced interfuel substitution and energy conservation. Among the supply options studied are (1) direct combustion of coal to generate electricity, (2) conversion of coal to synthetic fuels, (3) nuclear energy - first from the light water reactor and later from the fast breeder, (4) hydrogen via an efficient production process; and (5) distant future technical options such as fusion and central station solar power (aggregated together and described only as an advanced technology).

(ENERGY-TECHNOLOGY, UNITED-STATES, ENERGY POLICY, HYDROGEN-BASED-ENERGY, MODEL, ENERGY-CONSERVATION, ECONOMICS)

ST77 10129 REGENERATIVE ENERGY SOURCES - ENERGY CONVERSION AND UTILIZATION FEASIBILITY

Meliss, M., (Kernforschungsanlage Juelich GMBH, Juelich, West Germany), Brennstoff-Waerme-Kraft, V 29:136-142, Apr 1977, A77-31577, In German

The significance of the various primary energy sources with respect to a utilization in West Germany is examined. In the case of geothermal energy, it is found that the current possibilities concerning a use of this energy source in West Germany are very limited. The feasibility to utilize solar radiation is also investigated. It is estimated that about 100% of the hydroelectric power potential in West Germany will be utilized in 1985. However, there might be possibilities for technology export in connection with currently not exploited water power resources outside Germany. The large-scale utilization of the available wind energy depends on the solution of energy storage problems. Attention is also given to heating systems utilizing heat pumps and the employment of flat plate solar energy collectors.

(ENERGY-TECHNOLOGY, STORAGE, GERMANY, HEAT-PUMPS, WIND, FLAT-PLATE)

ST77 10130 ENERGY SOURCES FOR TOMORROW

Meliss, M., (Kernforschungsanlage Juelich G.M.B.H., Germany), Feasibility Studies of Regenerative Types, 1976, Translated From a German Paper, ERDA-TR--226, EDB-77:054966
Avail:NTIS

The regenerative sources of solar energy, wind, energy from the seas, earth heat, and running water were investigated by a consortium of major research installations. The sources were assessed first on a global basis, then more specifically for the German Federal Republic. This paper summarizes results from the complete study, but is devoted mostly to an analysis of utilization of wind energy, using the following topics: Physical Bases and Theoretical Potential, Wind Energy Installations and Technically Useful Potential, Utility Aspects, and Recommendations for Research and Development Work.

(ECONOMICS, ENVIRONMENTAL-EFFECTS, FEASIBILITY-STUDIES, GERMANY, MARKET, WIND)

ST77 10131 CALIFORNIA'S ENERGY FUTURE

Morris, D.N., (Rand Corp., Santa Monica, CA), 31 p., AD-A032221 P-5616, N77-22667
Avail:NTIS

This paper presents an abridgement of the results of a Rand study on energy policy issues facing California, more fully reported in Energy Alternatives for California - Paths to the Future, R-1793-CSA/RF, and summarized in some detail in an executive summary, R-1793/1-CSA/RF. The study is concerned with the problems of an uncertain future. These problems are extraordinarily complex and interwoven. Under conditions of rapid change, the full consequences of policy actions are difficult to predict and policy objectives are difficult to define. In addition, the relationships between state and federal actions are poorly understood, involving issues of equity among individuals and regions, and issues of environment, health, safety, and land use. Simple solutions should not be expected in such a policy area. However, a number of recommendations are presented because policy decisions should be made on the basis of the best information available when the political process demands they be made. The brief summary presented here necessarily omits most of the rationale for our conclusions and recommendations, as well as a number of subsidiary conclusions. The interested reader should consult the full report for these additional details.

(ENERGY POLICY, ENERGY-CONSERVATION, ENERGY-TECHNOLOGY, ENVIRONMENT)

ST77 10132 OVERVIEW

Quarles, J., (Environmental Protection Agency, Washington, DC), Capturing the Sun Through Bioconversion, EDB-77:047342

Diminishing fossil fuel resources and the growing dependance on foreign oil supplies necessitate energy conservation. Some areas in which this might be achieved are outlined, but conservation will not create new energy supplies. Development of alternatives to imported oil has detrimental environmental effects. These are briefly discussed for fossil and conventional nuclear energy, synthetic fuels from oil shale and coal, breeder reactors, geothermal energy, and offshore oil and gas recovery. The implementation of bioconversion, both to dispose of wastes while producing energy and to develop biomass for energy conversion, offers an alternative without many of the serious environmental problems associated with other energy sources. The environmental problems presented by this alternative must, however, be carefully evaluated.

(BIOMASS, ENERGY-CONSERVATION, ENVIRONMENTAL-EFFECTS, WOOD)

ST77 10133 ENERGY - LOS ANGELES TACKLING THE CRISIS; PROCEEDINGS OF THE SECOND GREATER LOS ANGELES AREA ENERGY SYMPOSIUM, LOS ANGELES, CA, MAY 19, 1976

Robinson, J.W., (McDonnell Douglas Astronautics Co., Huntington Beach, CA), Los Angeles Council of Engineers Scientists Proceedings Series, V 2:256, 1976, Western Periodicals Co., North Hollywood, CA, Symposium Sponsored by the LACES, ANS, AIAA, AICHE, AACE, ISGE, ASCE, IEEE, PMI, WESA, and AIME, For Individual Items See A77-26077 to A77-26091, A77-26076

Attention is given to alternate fuels (such as methane, solid waste, oil shale, etc.), conservation and the environment, wind power, geothermal/solar/hydraulic/wave energy, and energy economics. Particular papers are on electrical energy as a sulfur dioxide air pollution control strategy, economic considerations in selecting a nuclear vs. coal plant, windmill optimization, power production from high salinity geothermal waters, and harnessing the ocean waters, swells and tides.

(CONFERENCES, ENERGY-TECHNOLOGY, ECONOMICS, ENERGY-CONSERVATION, ENERGY POLICY, ENVIRONMENT-EFFECTS, CALIFORNIA, WAVES, WIND, TIDES)

ST77 10134 PERSPECTIVES IN ENERGY: 1976

Shultis, J.K., (Kansas State Univ., Manhattan, KS), 429 p., Aug 2, 1976, CES-17

This compilation of seventeen lectures is based on presentations from summer workshops held at Kansas State University. Information is covered on the current status of the energy situation to alternate energy options. Lecture titles are: Energy and Civilization, J. K., Shultis;

Energy Resources, T.W. Lester; Current U.S. Energy Systems, J.K. Shultis; Energy Conservation and Future Impact, T.W. Lester; Conventional Electrical Energy Production, T.W. Lester; Nuclear Power Reactors, J.K. Shultis; Electrical Generation and Distribution, T.W. Lester; Direct Use of Fossil Fuels, N.D. Eckhoff; Use of Solar and Wind Energy as Alternative Energy Sources, J.T. Pytlinski; Other Future Energy Alternatives (geothermal, biomass, ocean thermal energy conversion, shale oil, tar sands, wastes, tidal and wave energy, fusion reactors, coal conversion, fuel cells, and new energy storage concepts), A. Coulson; Financial-Consideration, N.D. Eckhoff; Radioactivity and Biological Effects of Radiation; J.K. Shultis; Environmental Pollution From Energy Production, N.D. Eckhoff; Environmental Effects of Consumption, J.K. Shultis; Risk/Benefit Considerations, J.K. Shultis; Towards a National Energy Policy, J.R. Hamilton; and Planning and Licensing an Electric Power Plant, J.K. Shultis.

(WORKSHOPS, ENERGY-CONSERVATION, WIND, BIOMASS, TIDAL, WAVE, FINANCIAL-CONSIDERATIONS, ENVIRONMENTAL-EFFECTS, NATIONAL POLICY, OCEAN ΔT)

ST77 10135 FORMULATION OF ENERGY POLICIES: THE CASE OF WEST AFRICA

Soussou, J.E., Seifert, W.W., (MIT, Cambridge, MA), Heliotech and Dev, Proc of the Int Conf, Dhahran, Saudi Arabia, Nov 2-6, 1975, Publ by Dev Anal Assoc, Cambridge, MA, V 2:609-635, 16 refs, 1976

A set of models, developed for West Africa, illustrates the role of modeling in the formulation of long-term energy policies. These models yield energy demand projections and costs associated with alternative energy policies over the period 1970-2000. They focus on the trade-offs entailed in the high initial costs of developing local resources as opposed to importing hydrocarbon fuels.

(MODELS, ENERGY POLICY, LONG-TERM)

ST77 10136 SOLAR ENERGY, GEOTHERMAL ENERGY, GRAVITATION IN COMBUSTION WITH ROTATIONAL ENERGY ON THE QUESTION OF ECONOMICAL UTILIZATION OF INEXHAUSTIBLE ENERGY SOURCES WHILE SHOWING CONCERN FOR THE ENVIRONMENT

Stoy, B., (Rheinisch-Westfaelisches Elektrizitaetswerk A.G., Essen, Germany), Energie-Verl., Heidelberg, Germany, EDB-77:061488, In German

The following so-called renewable sources of energy are taken into account: earth's core, earth's crust, river water, ground water, glacier ice, sea water, waves, tides, wind, ambient air and solar radiation. Six of these eleven sources of energy will not be considered in the light of the basic conditions outlined above, as is explained in the report. The remaining five sources of energy are compared with each other in a detailed study with respect to the technical systems needed to utilize them, their economics as against competing sources of energy, availability, ecological impact and their possible contribution in 1990 on the basis of today's energy requirement. It emerges from the study that by far the best possibilities are offered by ambient air, a source of energy simply over-looked in system studies so far. Since the direct or indirect use of solar energy is not feasible either technically or physically without the application of electricity.

(ECONOMICS, ECOLOGICAL-IMPACT, COMPARATIVE-EVALUATIONS, FEASIBILITY-STUDIES, GERMANY, TIDAL-POWER, WIND)

ST77 10137 REGENERATIVE ENERGY SOURCES

Stoy, B., (Wehlmann, Essen, Germany), Ergebniss Von Entwicklungsarbeiten Zur Nutzung Der Sonnenenergie, EDB-77:043282

This initatory paper referring to the report and discussion meeting by RWE-Anwendungstechnik gives a survey and shows the characteristics of regenerative energy sources such as ground, ground water, running water, ambient air, solar radiation. The utilization of these energy sources requires current, the production of which cannot be substituted for this reason. A concept for energy supply in the future is developed.

(GERMANY, OVERVIEW)

ST77 10138 PLACE AND ROLE OF VARIOUS ENERGY RESOURCES IN ENERGETICS OF THE FUTURE

Styrikovich, M.A., (Academy of Sciences, National Committee for Heat and Mass Transfer, Moscow, USSR), In Alternative Energy Sources, p. 1-17, 1976, Academic Press, Inc., New York, NY, Hemisphere Publishing Corp., Washington, DC, A77-31467 13-44, A77-31468

An evaluation is conducted regarding the significance of various sources of energy, taking into account the situation during the first three quarters of the 20th century and future developments. Estimates are obtained concerning the main categories of the world energy sources, giving attention to oil, natural gas, coal, nuclear fuel, solar energy, hydraulic resources, geothermal resources and power resources related to the energy of wind, tide, sea current and waves. Developments concerning the growth in energy demand are considered and energy supply prospects are investigated.

(ENERGY-TECHNOLOGY, TIDEPOWER, WIND, WAVES, ENERGY-DEMAND, OCEAN ΔT)

ST77 10139 TECHNOLOGY FORECASTING FOR THE FOUNDRY INDUSTRY OF INDIA

Vyas, B.J., Bowonder, B., Rohatgi, P.K., (Indian Inst. of Science, Bangalore, India), Int. Cast Met. J., V 1:35-38, N1, Mar 1976, EDB-77:043426

The potential use of technological forecasting (TF) in planning future research, development and production in the foundry industry of India is discussed. The likely production levels of major ferrous castings have been derived for the next 25 years, using trend extrapolation techniques. Priority imperatives for R and D and production intrastructure for the foundry industry of India is considered and a desirable scenario of the Indian industry in the year 2000 is derived. Some of the important imperatives for the Indian foundries are increased production of ductile iron, Al- and Mg-base alloys and die casting of ferrous as well as nonferrous alloys. To conserve energy, development of high thermal efficiency cupolas and other furnaces, utilization of waste heats, reduction material handling, cutting down riser sizes and casting processes producing castings requiring almost no cleaning have to be adopted in Indian foundries.

(ENERGY-CONSERVATION, FURNACES, MATHEMATICAL MODELS, WIND)

ST77 10140 WORLD ENERGY SOURCES FOR THE NEXT CENTURY

Watson-Munro, C.N., (International Solar Energy Society, Highett, Australia); International Solar Energy Society Symposium, 1973, INIS-MF-1472, EDB-77:049849

Four future energy sources including the fast breeder, fusion, geophysical and solar energy are described. A discussion is given of the current research situation, the possible developments, the resources and the economic, environmental and social consequences of these four options.

(SOCIAL-CONSEQUENCES, ECONOMICS, ENVIRONMENTAL-EFFECTS)

ST77 10141 ARMCHAIR PROSPECTING: AUTOMATING THE FINDING AND PROCESSING OF MATERIALS FOR NEW ENERGY SYSTEMS

Whitney, W.M., Floyd, E.L., Griffiths, R., Macomber, H.L., (Jet Propulsion Lab., Pasadena, CA), AIP (Am. Inst. Phys.) Conf. Proc., V 32:297-311, 1976, EDB-77:059203

The materials needed for present and future power systems are becoming harder and more expensive to obtain and the demand for them is growing. Meeting future needs and keeping the costs down may require automating some of the steps in locating and extracting materials and preparing them for use. An automated system can be regarded as a tool that, by augmenting human information processing and control, makes individual efforts more productive. Despite large differences in form and in application, all automation systems have some common underlying features. These are illustrated with examples drawn from planetary and undersea exploration, coal mining and solar-cell fabrication.

(MATERIALS, AUTOMATION, SOLAR-CELLS, ECONOMICS)

ST77 10142 INDIA AND THE ENERGY CRISIS

Zaheer, S.H., (Regional Research Lab., Hyderabad, India), Chem. Age, India, V 25:609-614, N9, Sept 1974, EDB-77:036158

Experience has shown that the creation of the India Central Water and Power Commission was a mistake because of its bias toward hydroelectric power and its failure to plan for adequate power supplies, i.e. a goal of about 5 kW per person. Emphasis should now be placed on Zaheer's proposal for gasification and liquefaction of coal at the minehead and pipeline transport of the gas to domestic and industrial users, thus easing the strain on the railroads caused by transport of coal. The current Indian situation also requires, e.g. a stepped-up search for mineral resources/ a ban on the development of hazardous nuclear fission reactors/ a ban on the use of fuel oil for power generation/ a drastic curb in the use of petroleum middle distillates coupled with an attempt to produce more/ and the development of solar and geothermal energy.

(ENERGY POLICY)

11,000 SOLAR OVERVIEWS

ST77 11071 AIAA/AAS (AMERICAN ASTRONAUTICAL SOCIETY) SOLAR ENERGY FOR EARTH CONFERENCE, PAPERS, 1975

Anon, (AIAA, New York, NY), AIAA/AAS (Am Astronaut Soc) Sol Energy for Earth Conf, Pap, Los Angeles, CA, Apr 21-24, 1975, Publ by AIAA, New York, NY, 1975

The volume contains 18 papers presented at the Conference. Among the topics covered are cooling by solar heat, an overview of insolation in the United States, ocean thermal energy conversion, tropical ocean thermal power plants, solar power plant design, satellite solar power stations and others.

(COOLING, UNITED-STATES, THERMAL-POWER, OCEAN-AT)

ST77 11072 HANDBOOK OF HOMEMADE POWER: THE MOTHER EARTH NEWS

Bantam Books, New York, NY, 1974, EDB-77:047378
$2.25
Reprint and original articles on using various energy sources including solar energy are presented. Instructions on how to build and use solar cookers, ovens, heaters, and water heaters, plus an extensive bibliography are included.

(BIBLIOGRAPHIES, SOLAR COOKERS, HEATING, WATER HEATERS)

ST77 11073 LARGE TEST PLANT FOR THE UTILIZATION OF SOLAR ENERGY

Wasser, Luft Betr., V20:528-529, N10, Oct 1976, EDB-77:047307
A test plant for the utilization of solar energy in low-temperature-spheres with funds of the Federal Ministry of Technology and Messrs. Energietechnik Gmbh, Essen, constructed in Wiehl, a climatic resort. This plant is thought to be the largest in Europe. The plant, its technical equipment and the conceptions of energy supply are introduced and the aim and programme of the technical and scientific examinations are referred to.

(HEATING, RESEARCH-PROGRAMS, SWIMMING-POOLS, GERMANY)

ST77 11074 NATIONAL PLAN FOR ENERGY RESEARCH, DEVELOPMENT AND DEMONSTRATION CREATING ENERGY CHOICES FOR THE FUTURE VOLUME 2 PROGRAM IMPLEMENTATION-FOSSIL FUELS, SOLAR ENERGY AND GEOTHERMAL ENERGY

(ERDA, Washington, DC), 409 p., ERDA-76-1-VOL-2, N77-19600
AVAIL:NTIS
The federal energy research, development and demonstration programs now underway are described along with possible future efforts. Financial data for FY 75, FY 76, and FY 77 are presented. Energy technology programs, supporting technology programs, energy-related supporting activities, special analyses and an appendix are included. Fossil energy (coal, petroleum, and natural gas), solar energy and geothermal energy, are discussed together with conservation, fusion power, fission power, and the nuclear fuel cycle.

(ENERGY POLICY, ENERGY-TECHNOLOGY, DEMONSTRATION-PROGRAMS)

ST77 11075 PRINCIPLES OF SOLAR TECHNOLOGY I: MEETING, 2nd, STUTTGART, WEST GERMANY, OCTOBER 22, 1976, REPORTS

(Meeting sponsored by the Deutsche Gesellschaft Fuer Sonnenenergie), Deutsche Gesellschaft Fuer Sonnenenergie, Munich, West Germany, 312 p., 1976, for individual items see A77-29563 to A77-29573, A77-29562, In German
Selective behavior and selective layer deposition in the case of light-transparent covers are considered along with the selectivity of absorbing layers, corrosion problems related to the employment of aluminum in collector construction, collectors and heat storage units made of plastics, the physical principles of photoelectric conversion, the consideration of climatic data in the prediction of solar-system performance, and heat transfer problems in flat plate collectors. Attention is given to meteorological data regarding the utilization of solar energy, scientific and technological principles of latent heat storage, energy considerations related to the acquisition and utilization of solar energy, and the determination of the performance characteristics of solar collectors.

(CONFERENCES, ENERGY-TECHNOLOGY, CORROSION-RESISTANCE, STORAGE, METEOROLOGICAL-PARAMETERS, PLASTICS)

ST77 11076 PROCEEDINGS OF THE SOUTHEASTERN CONFERENCE ON APPLICATION OF SOLAR ENERGY, 2nd, 1976

Anon, (ERDA, Oak Ridge, TN), Proc of the Southeast Conf on Appl of Sol Energy, 2nd, Baton Rouge, LA, Apr 19-22, 1976, Sponsored by ERDA, Oak Ridge, TN, 487 p., 1976, CONF-760423
Avail:NTIS, Springfield, VA
Forty-seven papers by various authors are presented. The topics discussed are: Collectors, water and space heating, cooling, radiation and thermal performance, design for energy conservation, bed regenerators, solar distillation, air heating, gravel bed thermal store, solar life cycle cash flow analysis, solar energy in Florida, North Carolina, India, South Africa, and Australia, impact of solar energy utilization, low cost collectors, truncated Winston's collector for refrigeration, concentrators, computer directed solar heating, dehumidification, retrofit water heating, selective coatings, electric power systems, weather representation, wind power, performance, industrial process heating, simulation, swimming pools, pumping, feed mills, storage, and aquifer storage of energy.

(ENERGY-TECHNOLOGY, ENERGY-CONSERVATION, DISTILLATION, HEATING, LIFE-CYCLE, FLORIDA, NORTH-CAROLINA, INDIA, SOUTH-AFRICA, AUSTRALIA)

ST77 11077 SOLAR ENERGY - A PART OF THE ANSWER

Anon, Power, V121:38-43, N3, Mar 1977

Mainly the direct thermal applications of solar energy are surveyed. Application of thermal collectors for heating and cooling buildings and for heating liquids, usually water for domestic or process use, is described and illustrated.

(THERMAL-APPLICATIONS, COOLING, HEATING)

ST77 11078 SOLAR ENERGY AND DEVELOPMENT

Oct 2, 1976, CONF-760936, Translation of French Report, EDB-77:053819
NTIS $3.50
A program to speed utilization of solar energy in the West African states is recommended.

(AFRICA, RESEARCH-PROGRAMS)

ST77 11079 SOLAR ENERGY RESEARCH AT GEORGIA TECH

(Georgia Institute of Technology, Atlanta, GA), 1976, EDB-77:036252
Solar energy research programs have been underway since 1971 and include projects for the Federal Government and private industry. The school cooperates with the Centre National De La Recherche Scientifique in operating a solar furnace in Southern France. Martin Marietta Corporation cooperates in the construction of a bench model to provide design and operating data, while a scale model on the campus demonstrates the capacity to produce clean heat for testing ceramic and crystal endurance. Descriptions of other projects include (1) a central receiver solar thermal power system to demonstrate electric power generation by solar thermal conversion, (2) a thermal storage subsystem to store heat in liquids, (3) a 5-mw solar thermal testing facility in New Mexico to test experimental designs of solar equipment, (4) a 400-kw test facility on the campus to provide data for improving solar energy steam generation, (5) a central receiver open-cycle gas turbine design for solar thermal conversion to electricity, (6) solar collectors for process heat, (7) agricultural drying experiments on tobacco, peanuts, and grain, (8) flat-plate collectors on an elementary school for temperature control, (9) a demonstration solar community center, to be accompanied by a solar housing development, (10) a solar rock collector for home heating, and (11) a wind energy conversion system.

(GEORGIA, INTERNATIONAL-COOPERATION, RESEARCH-PROGRAMS, THERMAL-POWER, WIND)

ST77 11080 SOLAR ENERGY: SUN IN SERVICE OF MAN

(Utlandssekretariatet, Stockholm), 1973, EDB-77:041523
Utilization of solar energy for space heating, cooking, desalination, and pumping are reviewed.

(DESALINATION, SOLAR COOKING, HEATING, WATER-PUMPS, OVERVIEW)

ST77 11081 SOLAR ENERGY UPDATE, JANUARY 1977. ABSTRACTS 1-228

(ERDA, Oak Ridge, TN), Jan 1977, 12 issues, SEU-77/1, NTISUB/C/145, Paper copy available on subscription, North American Continent price $27.50/year; single copy price PC$3.25/MF$3.00; all others write for quote
Solar Energy Update (SEU) provides abstracting and indexing coverage of current scientific and technical reports, journal articles, conference papers and proceedings, books, patents, theses, and monographs for all sources on solar energy. The subject matter covered by SEU includes solar thermal, photovoltaic, biomass conversion, ocean thermal, heating and cooling, wind power, and wave energy.

(ABSTRACT, INDEX, ERDA, BIBLIOGRAPHIES)

ST77 11082 NEW FRONTIERS IN SOLAR AND OTHER ENERGY OPTIONS

Abdel-Hameed, M.F., El-Difrawi, A.A., (North Illinois Univ, Dekalb, IL), Heliotech and Dev, Proc of the Int Conf, Dhahran, Saudi Arabia, Nov 2-6, 1975, Publ by Dev Anal Assoc, Cambridge, MA, V 2:525-540, 31 refs, 1976
Nonpolluting options such as solar energy and related approaches are discussed. Several new frontiers in solar technology are described: photosynthesis, synthetic leaf, hydrogen energy, wind power, artificial tornados, space colonization, and colonization of marginal habitats on earth.

(WIND, ENERGY-TECHNOLOGY)

ST77 11083 WATER REQUIREMENTS FOR SOLAR ENERGY

Backus, C.E., Brown, M.L., (Arizona State Univ., Tempe, AZ), American Water Works Association, Journal, V 68:366-369, N7, 13 refs, July 1976, 8 fig, Solar Energy, W77-02122.
Like many of the systems that convert traditional energy sources into more useful forms, some that convert direct solar energy require water, usually for cooling. The use of several

forms of energy for converting solar energy and their water requirements are discussed and evaluated. Of the many proposed applications for solar energy use, electric power generation is the one expected to require the largest amounts of water. Some thermal plants also require significant amounts of water, while the photovoltaic plants require no water. The interdependence of insolation and water availability is a factor in determining the type of solar power plant that is feasible in a given area. Maps compare the mean annual runoff and groundwater supplies with the mean daily total or direct insolation, when there is nothing such as dust or water vapor between the sun and the collector. Cooling method and mechanisms are evaluated and projections regarding the use of solar energy are given.

(ARIZONA, WATER-ALLOCATION POLICY)

ST77 11084 SOLAR ENERGY DEVELOPMENT IN THE USA

Benseman, R.G., (New Zealand Energy Research and Development Committee, Auckland, New Zealand), Dec 1974, NP-21437, EDB-77:053826, US sales only
Avail:NTIS HC$3.50
A survey of solar energy developments in the USA in 1974 is presented.

(RESEARCH-PROGRAMS)

ST77 11085 PROCEEDINGS OF FIRST SEMIANNUAL EPRI SOLAR PROGRAM REVIEW MEETING AND WORKSHOP. VOLUME I - SOLAR HEATING AND COOLING OF BUILDINGS

Bos, P., (Atlas Corp., Santa Clara, CA), (Sponsored by EPRI), 124 p., Proc. held at San Diego, CA, Mar 8-12, 1976, EPRI-ER-283-SR-VOL-1, PB-260594/7, N77-21721
Avail:NTIS
A brief description of the ERDA solar program covering current and projected activities in the thermal applications and electric applications, solar heating and cooling of buildings requirements, definition and impact analysis, individual load center-solar heating and cooling residential project, an investigation of methods to improve heat pump performance and reliability in a northern climate, solar materials and components test program, and solar data verification project are discussed.

(CONFERENCES, IMPACT-ANALYSIS)

ST77 11086 SOLAR ENERGY AND ITS POSSIBLE USES. II

Brinkworth, B.J., Steinsvoll, O., Fra Fys. Verdan, V 37:85-87, N4, 1975, EDB-77:041453, In Norwegian
A great advance in the use of solar energy would occur if the energy in solar photons could be used directly. A suitable single step photocell for this purpose could have a theoretical maximum conservation efficiency of 45 percent. Photochemical processes could possibly be used, because these are efficient, however, the photoenergy available from the sun is low. For universal use, the amount of solar energy required is too large to be obtained except through more conventional methods e.g. storage through evaporation or by the planting of trees. The best method of using energy from the sun in more direct ways is by means of small local conversion stations. Power can then easily be brought to isolated communities for water distillation and communication equipment for which power demands are comparatively low.

(PHOTOSYNTHESIS, PHOTOVOLTAIC)

ST77 11087 SOLAR ENERGY - WORLD VIEW

Cohen, S., Consult Eng, Barrington, IL, V 48:104-106,108,110, N3, Mar 1977
Major solar energy programs that are underway in Europe, Asia, the Mideast and Far East, and Australia are reviewed.

(ENERGY POLICY, EUROPE, ASIA, MIDEAST, FAR-EAST, AUSTRALIA)

ST77 11088 POTENTIAL ENVIRONMENTAL IMPACTS OF SOLAR HEATING AND COOLING SYSTEMS FINAL REPORT

Consroe, T.J., Glaser, F.M., Shaw, R.W., Jr., (Booz-Allen Applied Research, Inc., Bethesda, MD), 124 p., BAAR-9075-043-001, EPA-600/7-76-014, EPA-68-01-2942, PB-259970/2, N77-19683
Avail:NTIS
Potential environmental consequences of solar energy utilization for heating and cooling buildings are discussed. Areas in which both positive and negative impacts are possible are identified, the National Research and Development Program directed toward solar heating and cooling technology is summarized, and a general methodology for estimating the impact on air pollution of solar energy utilization in urban areas is presented.

(RESEARCH-PROJECTS)

ST77 11089 SOLAR ENERGY RESEARCH IN IRAN

Dabiri, A.E., (Arya-Mehr Univ, Tehran, Iran), Heliotech and Dev, Proc of the Int Conf, Dhahran, Saudi Arabia, Nov 2-6, 1975, Publ by Dev Anal Assoc, Cambridge, MA, V 2:659-664, 4 refs, 1976

The following major areas are being pursued: thermal processes for domestic applications including development of flat plate and concentrating collectors, solar water heating, space heating and air conditioning systems; solar cells development for use as the prime energy source in remote telecommunication transmission stations; and water desalination and hydrogen production with solar energy.

(DESALINATION, THERMAL-PROCESSES)

ST77 11090 SOLAR ENERGY PROJECTS IN SPAIN

De Azcarraga, L., (Com Nac de Energias Espec, Madrid, Spain), Heliotech and Dev, Proc of the Int Conf, Dhahran, Saudi Arabia, Nov 2-6, 1975, Publ by Dev Anal Assoc, Cambridge, MA, V 2: 674-680, 1 ref, 1976

Solar energy could provide 5 percent of Spain's energy need by the end of the century. The projects carried out by several institutions include solar thermal conversion, air-conditioning, water heating, and photovoltaic conversion.

(THERMAL-CONVERSION)

ST77 11091 HEAT AND MASS TRANSFER FOR SOLAR ENERGY UTILIZATION

Denton, J.C., (Am Technol Univ, Killeen, TX), Int Semin on Future Energy Prod - Heat and Mass Transfer Probl, Dubrovnik, Yugoslavia, V 1:55-67, 10 refs, Aug 25-30, 1975, Publ by Hemisphere Publ Corp, Washington, DC, 1976

The basic relationships which govern the heat and mass transfer processes encountered in solar collectors and energy storage units and some unsolved problems are identified. It is concluded that the adoption of solar energy systems is not technology limited although several technological advances would be helpful.

(STORAGE, ENERGY-TECHNOLOGY)

ST77 11092 CONVERSION OF SOLAR ENERGY INTO HEAT

Devin, B., Etievant, C., (CEA Centre D'Etudes Nucleaires De Grenoble, 38, France), (CEA Centre D'Etudes Nucleaires De Fontenay-Aux-Roses, 92, France), 1975, CEA-CONF-3402, EDB-77: 035279, In French

Argument prevails regarding the main parameters involved in the definition of installations designed to convert by means of a thermal machine, solar energy into electrical or mechanical energy. Between the temperature of the cold source and the stagnation temperature, there exists an optimal temperature which makes for the maximum efficiency of the collector/thermal machine unit. The optimal operating conditions for different types of collector are examined. Optimization of the surface of the collector is dealt with in particular. The structure and cost of solar installations are also analyzed with some examples as basis: solar pumps of 1 to 25 kW, a 50 mWe electrosolar plant. The cost involves three main elements: the collector, the thermal unit and the heat storage device. The latter is necessary for the integration of diurnal and nocturnal fluctuations of isolation. It is shown that thermal storage is economically payable only under certain conditions.

(ECONOMICS, STORAGE, OPTIMIZATION, THERMAL-EFFICIENCY, FRANCE)

ST77 11093 SOLAR ENERGY IN AUSTRALIA

Dunkle, R.V., (CSIRO, Victoria, Australia), Proc of the Southeast Conf on Appl of Sol Energy, 2nd, Baton Rouge, LA, Apr 19-22, 1976, Sponsored by ERDA, Oak Ridge, TN, p. 258-263, 8 refs, 1976, CONF-760423
Avail:NTIS, Springfield, VA

Outside of the agricultural field the major use of solar energy is for salt production from sea water. The only other significant use of solar energy is for water heating, mainly for domestic and institutional installations.

(AGRICULTURAL, HEATING, DISTILLATION)

ST77 11094 IS SOLAR ENERGY THE LONG-TERM SOLUTION TO THE ENERGY CRISIS?

Dunn, P.D., Elektron Int., V 12:440, 1975, EDB-77:060553, In German

A synchronous satellite is briefly described for converting solar radiation into a microwave beam for directing onto the earth. Also a solar collector on the earth's surface that uses an array of mirrors to direct solar radiation onto a boiler or furnace is mentioned.

(SSPS, THERMAL-POWER)

ST77 11095 WORK IN THE EMPLOYMENT OF SOLAR ENERGY IN SOVIET ASIA

Fedoseev, V.A., Heat. Vent. Eng., V 18:3-4, N205, 1944, EDB-77:060682
No abstract available

(STILL, USSR)

ST77 11096 SOLAR ENGINEERING IN ECUADOR

Foster, A.R., (Northeast Univ., Boston, MA), ASHRAE J., V 18:43, N11, Nov 1976, EDB-77:053866
The need for solar energy usage in Ecuador is briefly discussed. Two solar water heaters designed by graduated students are described.

(ECUADOR, EDUCATION-PLANNING, RESEARCH-PROGRAMS)

ST77 11097 FLORIDA SOLAR ENERGY PROGRAM

Harrenstien, H.P., (Florida Solar Energy Cent, Cape Canaveral, FL), Proc of the Southeast Conf on Appl of Sol Energy, 2nd, Baton Rouge, LA, Apr 19-22, 1976, Sponsored by ERDA, Oak Ridge, TN, p. 224-233, 1976, CONF-760423
Avail:NTIS
The Florida Solar Energy Center at Cape Canaveral, Florida, its organization, goals, program, and aspirations are presented. Activities of the Center during its first year of operation are listed, and plans for the increasing involvement of solar energy in the lives of Floridians are mentioned. A plea is made for the establishment of a cooperative effort which involves more of the Southeast Region in the activities of the Center.

(COOPERATIVE-EFFORT, SOUTHEAST)

ST77 11098 EXPLOITATION OF SOLAR ENERGY IN GREECE

Hatzikakidis, A.D., (COMPLES, Athens, Greece), Heliotech and Dev, Proc of the Int Conf, Dhahran, Saudi Arabia, Nov 2-6, 1975, Publ by Dev Anal Assoc, Cambridge, MA, V 2:670-673, 1976
Scientific research since 1956 is reviewed and development of solar evaporators, water heaters, and desalination devices is described.

ST77 11099 ERDA'S SOLAR ENERGY PROGRAM

Herwig, L.O., (ERDA, Washington, DC), ASTM Stand. News, V 3:29, N8, Aug 1975, EDB-77:060556
General objectives in each subprogram for the next five years are summarized. Solar thermal objectives are to design, construct, operate, and evaluate a 10 mW electric, central receiver pilot power plant/ a total energy pilot power plant of 200 kW electric and 200 kW thermal size/ and a distributed collector pilot plant. Photovoltaic objectives are to reduce solar array prices to about $5 per peak watt by 1978 through lower-cost fabrication techniques and economics of increasing production. Wind objectives are to develop and demonstrate large-scale (100 kW to multimegawatt electric) single-unit wind energy systems for selected applications. Bioconversion objectives are to design, construct, operate and evaluate pilot plants for conversion of urban organic waste and agricultural waste materials to methane gas. Ocean thermal objectives are to design and construct facilities for test and evaluation of components and subsystems for ocean thermal power plants.

(OCEAN-ΔT, PHOTOVOLTAIC, RESEARCH-PROGRAMS, THERMAL-POWER, WIND)

ST77 11100 ENGINEERING UTILIZATION OF SOLAR ENERGY

Hottel, H.C., Proc. Am. Acad. Arts Sci., V 79:313-318, July 1951, EDB-77:041568
No abstract available

(FABRICATION, FLAT-PLATE, PERFORMANCE)

ST77 11101 SOLAR COLLECTORS

Hullmann, H., Schmidt, B., (Technische Univ., Hannover, Germany), Dtsch. Bauz., Fachbl. Entwurf Ausfuhrung, V 4:437-441, 1976, EDB-77:053842, In German
The utilization possibilities of solar energy for the energy supplying of buildings are becoming increasingly more significant. Solar research at the moment aims predominantly with a high level of efficiency and therefore making accessible a significant range of applications for solar technology. Parallel to this are attempts to effect the saving of energy, be it in the demand for energy-saving constructions for in the increasing development and application of rational energy utilization by technologists. The most important point of these activities at the moment, is still technological methods.

(SOLAR-TECHNOLOGY, RATIONAL-ENERGY, ENERGY-TECHNOLOGY)

ST77 11102 RECENT RESULTS IN THE RESEARCH AREA 'ENERGETICS' WITH RESPECT TO NONNUCLEAR ENERGY RESEARCH

Just, T., (Deutsche Forschungs- Und Versuchsanstalt Fuer Luft- Und Raumfahrt, Stuttgart, West Germany), DFVLR-Nachrichten, p. 834-842, Feb 1977, A77-29300, In German

The considered results are related to system analyses for flat plate solar collector systems, approaches utilizing latent-heat storage units for solar-energy heating systems, the development of small solar electric-power systems with an output in the range from 10 kW to 500 kW for an employment in developing countries, and studies of soot formation and oxidation in hydrocarbon combustion. Attention is also given to a high-energy laser, an electrically excited gasdynamics co laser, and a plasmadynamic laser.

(ENERGY-TECHNOLOGY, GERMANY)

ST77 11103 FUTURE DEVELOPMENT WORK ON THE UTILIZATION OF SOLAR ENERGY

Kalischer, P., (Wehlmann, Essen, Germany), Ergebnisse Von Entwicklungsarbeiten Zur Nutzung Der Sonnenenergie, EDB-77:041503, In German

A short prospect for the activities planned by RWE-Application techniques is given.

(PLANNING, GERMANY)

ST77 11104 HELIOTECHNIQUE AND DEVELOPING COUNTRIES

Kara, K.M., Tabet-Aoul, M., (Inst Hydrometeorl de Form et Rech, Oran, Alger), Heliotech and Dev, Proc of the Int Conf, Dhahran, Saudi Arabia, Nov 2-6, 1975, Publ by Dev Anal Assoc, Cambridge, MA, V 2:636-640, 1976, In French

Means of advancement of solar energy utilization in agriculture and industry through technology transfer, are discussed.

(ECONOMIC, SOCIOLOGICAL-EFFECTS, TECHNOLOGY-TRANSFER)

ST77 11105 HELIOTECHNIQUE AND DEVELOPMENT, VOLUME 1 AND VOLUME 2, 1976

Kettani, M.A., ed., Soussou, J.E., ed., (Univ of Pet and Miner, Dhahran, Saudi Arabia), Heliotech and Dev, Proc of the Int Conf, Dhahran, Saudi Arabia, Nov 2-6, 1975, Publ by Dev Anal Assoc, Cambridge, MA, 2 vols, 1516 p., 1976, In English and French

One hundred twenty one papers by various authors are presented. The topics discussed are: Measurements, spectral distribution, collectors, acceptors, thermal conversion, heat transfer, water heating, concentrators, cell panels, mirrors, storage, hydrogen production, photovoltaic conversion, photoelectrochemistry, solar thermal power generation, Rankine cycle, eucalyptus fuel plantation, heating, cooling, refrigeration, combined solar and petroleum energy systems, solar agriculture, decontamination, drying, water pumping, greenhouses distillation, desalination, demineralization, transportation systems, geothermal energy, and national programs.

(OVERVIEWS)

ST77 11106 STORAGE OF SOLAR ENERGY IN THE FORM OF POTENTIAL HYDRAULIC ENERGY

Kettani, M.A., (Univ of Pet & Miner, Dhahran, Saudi Arabia), Heliotech and Dev, Proc of the Int Conf, Dhahran, Saudi Arabia, Nov 2-6, 1975, Publ by Dev Anal Assoc, Cambridge, MA, V 1: 492-498, 5 refs, 1976

In areas where topography and solar energy income are compatible, solar energy could be used to pump water up to a higher level to be stored behind a dam. The stored water can then be used to produce hydroelectric energy in the conventional manner. The used water will then flow down to a reservoir at a lower level to be pumped up again in a closed cycle. For the system to be effective, losses of water by evaporation should be minimized, since water is acting here as a working fluid only. The feasibility of such a scheme is studied.

ST77 11107 HYDEL AND SOLAR POWER FOR PAKISTAN

Khan, M.I., (Univ of Eng & Technol, Lahore, Pakistan), Heliotech and Dev, Proc of the Int Conf, Dhahran, Saudi Arabia, Nov 2-6, 1975, Publ by Dev Anal Assoc, Cambridge, MA, V 2:576-582, 1976

Hydroelectric energy resources are reviewed and closing of the energy gap is discussed. Solar energy may be converted directly into electricity by the photovoltaic effect. It is suggested to use it for the large scale production of electric power (1000 mW). Costs are compared with power produced from other sources. With the present silicon solar cell technology, it is possible to design a large-scale power station and the calculations are carried out for a terrestrial 1000 mW station. A solar station located in Lyallpur with 540 cal/cm^2 day mean daily solar radiation on a horizontal surface would require 9 km^2 to generate a peak electric power of 1000 mW. Its daily production would be 5.85 million kWhr.

(HYDROELECTRIC, PAKISTAN, PHOTOVOLTAIC, LARGE-SCALE, OVERVIEWS)

ST77 11108 STATUS OF GOLDSTONE SOLAR ENERGY SYSTEM STUDY OF THE FIRST GOLDSTONE ENERGY PROJECT

Lansing, F.L., (JPL, California Inst. of Tech., Pasadena, CA), In It's the Deep Space Network, p. 120-140, See N77-21110 12-12, N77-21126
Avail:NTIS

The results reached by the DSN engineering section and private consultants in the review of the initial plan of the Goldstone energy project are summarized. The main objectives were in the areas of energy conservation and the application of solar-driven systems for power and hydrogen generation. This summary will provide background data for management planning decisions both to the DSN engineering section and other organizations planning a similar program. The review showed that an add-on solar driven absorption refrigeration unit with its associated changes to the existing system was not cost-effective, having a payback period of 29 years. Similar economically unattractive results were found for both a solar-hydrogen and a wind-hydrogen generation plant. However, cutting the hydrogen generation linkage from this plant improved its economic feasibility.

(ENERGY-CONSERVATION, ENERGY-TECHNOLOGY, WIND, MANAGEMENT-PLANNING, ECONOMIC)

ST77 11109 SOLAR ENERGY

Matthoefer, H., ed., (Umschau Verl., Frankfurt Am Main, Germany), 1976, EDB-77:041504, In German

The present publication contains the original manuscripts of the 17 lectures held at the Status Seminar on Solar Engineering on September 24th and 25th, 1975 at the University of Stuttgart. Invited to these lectures were all those institutions and firms which work on projects in the field of the utilization of solar energy supported by the Federal Ministry for Research and Technology.

(MANUSCRIPTS, FEASIBILITY-STUDIES, GERMANY, PLANNING, ECONOMICS, SYSTEMS-ANALYSIS)

ST77 11110 APPLIED SOLAR ENERGY AN INTRODUCTION, 2ND EDITION - BOOK

Meinel, A.B., Meinel, M.P., (Arizona, University, Tucson, AZ), (Research Supported by the Mulcahy Foundation, Helio Associates Corporate Research Funds, and NSF Reading, MA, Addison-Wesley Publishing Co., Inc.), NSF GI-30022, NSF GI-36731, NSF GI-41895, 667 p., 1977, A77-33445, PCS17.95

After a brief review of the history of solar energy applications, the book considers the energy resource, giving attention to solar flux and weather data and solar energy availability. The optics of solar collection is examined in detail with consideration of luminance, refractive optics, mirror optics, fixed-mirror collectors, and optical surfaces. Absorption, transfer and storage are discussed and such applications as thermodynamic utilization cycles, and direct conversion to electricity are examined.

(STORAGE, THERMODYNAMIC-CYCLES, THERMAL-POWER)

ST77 11111 NATIONAL SCIENCE FOUNDATION (U.S.A.) SOLAR ENERGY PROGRAM

Mukherjee, T., (Natl Sci Found, Washington, DC), Heliotech and Dev, Proc of the Int Conf, Dhahran, Saudi Arabia, Nov 2-6, 1975, Publ by Dev Anal Assoc, Cambridge, MA, V 2:696-701, 1976

The main objectives and major accomplishments of the United States' solar energy program initiated under the federal leadership of the National Science Foundation are reviewed. The overview includes a brief historical background, approach and program organization. Six terrestrial application areas of solar energy are addressed in the national program: (1) heating and cooling of buildings; (2) solar thermal energy conversion; (3) wind energy conversion; (4) ocean thermal energy conversion; (5) photovoltaic energy conversion, and (6) bio-conversion to fuels. The new research and applications projects are addressed to innovative technologies and systems having high risk, but high potential payoff.

(UNITED-STATES, OVERVIEW)

ST77 11112 SOLAR ACTIVITIES IN NORTH CAROLINA CIRCA MARCH 1976

Neal, C.L., (North Carolina Sci & Technol Cant, Research Triangle Park, NC), Proc of the Southeast Conf on Appl of Sol Energy, 2nd, Baton Rouge, LA, Apr 19-22, 1976, Sponsored by ERDA, Oak Ridge, TN, p. 234-243, 5 refs, 1976, CONF-760423
Avail:NTIS, Springfield, VA

Space heating and domestic hot water are covered including government involvements, university research, manufacturing, developers, custom builders, consultant and individuals.

(GOVERNMENT-INVOLVEMENTS, UNIVERSITY-RESEARCH)

ST77 11113 GEOTHERMAL ENERGY IN SAUDI ARABIA AND ITS USE IN CONNECTION WITH SOLAR ENERGY

Otkun, G., Sayigh, A.M., (Univ of Riyadh, Saudi Arabia), Heliotech and Dev, Proc of the Int Conf, Dhahran, Saudi Arabia, Nov 2-6, 1975, Publ by Dev Anal Assoc, Cambridge, MA, V 2:583-595, 9 refs, 1976

Geothermal energy can be extracted from hot springs and deep aquifers. The possibility of combining solar and geothermal energy to produce fresh water and electricity is discussed.

(DESALINATION)

ST77 11114 OPENING ADDRESS

Perrot, M., (COMPLES, Marseille, France), Heliotech and Dev, Proc of the Int Conf, Dhahran, Saudi Arabia, Nov 2-6, 1975, Publ by Dev Anal Assoc, Cambridge, MA, V 1:13-24, 1976, In French

Theoretical research and practical applications of solar energy, and organization of COMPLES, the Mediterranean Cooperation for Solar Energy, are reviewed. Future uses in developing countries are suggested in view of the fuel shortage.

(THEORETICAL-RESEARCH, PRACTICAL-APPLICATIONS, MEDITERRANEAN-COOPERATION, DEVELOPING-COUNTRIES)

ST77 11115 SOLAR TECHNOLOGY SOLAR ENERGY IN PRACTICAL APPLICATION, 3RD REVISED AND ENLARGED EDITION - GERMAN BOOK

Rau, H., (Munich, Udo Pfriemer Verlag GMBH), 239 p., 1976, A77-33113, In German, PC$15.60

The book provides an overview of the vast range of applications to which solar energy has been put throughout the world. The solar programs of different countries are reviewed, and the basic design and operation of a number of actual engineering realizations are described, including solar stills for desalinization, room heating, sun houses, solar-driven air conditioning with heat pumps, solar cookers, solar melting ovens, solar cells and batteries, and solar motors. Future projects for solar technology are also discussed, including a central solar power station, solar mirror in earth orbit, exploitation of ocean thermal gradients, and magnetohydrodynamic generators driven by solar heat.

(ENERGY-TECHNOLOGY, STORAGE, HEAT-PUMPS, OVERVIEW, OCEAN-ΔT)

ST77 11116 SOLAR ENERGY AND ENERGY CONSERVATION

Rush, W.F., (Institute of Gas Technology, Chicago, IL), 1976, CONF-760583--1, EDB-77:041506

Today's collection, storage, and utilization of solar energy is at the stage that, in the short term of the next 10 to 20 years, solar energy can be applied in the heating and cooling of buildings as well as in heating water. If a rational program can be adopted, reasonable projections indicate that by the year 2000, energy savings in fossil fuels can reach 170 billion kWhr while the value of such savings in 1970 dollars would be $4.5 billion/yr. Despite the apparent desirability of achieving these goals, many factors will affect the rate at which it is achieved. Technical achievements, economics, environmental pressures, energy costs and institutional barriers of the construction industry itself, and the roles played by the federal government, local government, and the financial communities will all have an effect upon the acceptance of solar energy in the short term. A discussion of some of these interrelationships, potential strategies that might develop, and their expected consequences is presented.

(INSTITUTIONAL-BARRIERS, ENVIRONMENTAL, GOVERNMENT, ECONOMICS, PLANNING)

ST77 11117 COMPOSITE METHOD OF PLOTTING PRODUCTIVITY PROVISION CURVES OF JOINTLY UTILIZED SOLAR AND WIND ENERGY PLANTS

Salieva, R.B., (Tashkent Electrotech. Inst. of Commun.), Geliotekhnika, V 4:52-56, 1976, EDB-77:054020, A77-29534, In Russian

A method of composite plotting of a resultant summary curve of provision of productivity of a solar and a wind energy plant jointly used for energy and water management purposes is considered.

ST77 11118 EXPERIENCE OF EVALUATION OF THE RELIABILITY OF SYSTEMS OF POWER SUPPLY FROM RENEWABLE ENERGY SOURCES BY TWO-MODAL DISTRIBUTION CURVES

Salieva, R.B., (Tashkent Electrotech. Inst. of Commun.), Geliotekhnika, V 4:57-62, 9 refs, 1976, EDB-77:054021, In Russian

The power supply considered as an example relates to a radio relay communication system which is to be equipped with wind and solar power plants supplemented occasionally by a diesel power plant. Mathematical description of the function of distribution of the length of the period of operation of an electric storage battery w$sub $phi$$ by means of a two-modal curve is considered. The parameter w$sub $phi$$ characterizes the distribution of the length of continuous functioning of the apparatus controlling the work of the electric storage battery. This is important if one is to take into account that 90-95 percent of the energy consumed is to be produced by wind energy or solar energy plants working jointly with an electric storage battery

(STORAGE, MATHEMATICAL MODELS, WIND)

ST77 11119 BASIS FOR DEVELOPING A SOLAR ENERGY INVENTORY

Salieva, R.B., (Tashkentskii Elektrotekhnicheskii Institut Sviazi, Tashkent, Uzbek SSR), Geliotekhnika, p. 61-77, N6, 1976, A77-25360, In Russian

The paper examines some of the principles of developing a solar energy inventory on the basis of a mathematical model, by the parameters of which it would be possible to determine the productivity of a solar energy facility of any design and establish its effectiveness and suitability for various types of landscapes. The mathematical model is considered from unified viewpoints of stochastic process theory. Modeling algorithms are given and results of computer calculations are given in tables, from which one can deduce the productivity and utilization factor of the rated power of facilities of arbitrary design.

(ACTINOMETERS, ENERGY-CONSERVATION, RADIATION-DISTRIBUTION, COMPUTERIZED-SIMULATION, MATHEMATICAL MODELS)

ST77 11120 EXERGY CONSIDERATIONS RELATED TO THE ACQUISITION, SUPPLY, AND UTILIZATION OF SOLAR ENERGY

Suter, P., Nicolescu, T., (Lausanne, Ecole Polytechnique Federale, Lausanne, Switzerland), Deutsche Gesellschaft Fuer Sonnenenergie, Munich, p. 237-282, 1976, In Principles of Solar Technology I; Meeting, 2nd, Stuttgart, West Germany, Oct 22, 1976, Reports, A77-29562 12-44, A77-29572, In German

The exergy concept provides an evaluation measure for chemical and thermal energy in its relation to mechanical and electrical energy. A meaningful application of the exergy concept is related to investigations concerning the replacement of oil-based heating technology by alternative approaches. Attention is given to the exergy equivalence of various forms of energy, the study of exergy chains, the consideration of the system solar collector-water storage tank on the basis of the exergy concept, and an example for the evaluation of energy chains.

(CHEMICAL-ENERGY, THERMAL-ENERGY, ENERGY-TECHNOLOGY, STORAGE, TECHNOLOGY-TRANSFER, EXERGY-CONCEPT)

ST77 11121 SOLAR ENERGY AS A CONTRIBUTION TO THE ENERGY CRISIS

Tabor, H.Z., (National Physical Lab. of Israel, Jerusalem), 1973, NP-21255, EDB-77:047314, US Sales Only
Avail:NTIS HC$3.50

The fact that the sun is the primary source of energy used on earth has created the impression in some quarters that solar energy is the answer to the energy shortage. It is the purpose of this paper to put the matter into proper perspective, to see clearly the difficulties and to determine to what extent and over what time scale solar radiation can contribute to our usable energy sources. Very long-term projections running into the next century and based upon a continuing growth rate in the world's energy consumption have suggested that finally the sun will be the major source of energy. But we are concerned with the next decade - or at most the remainder of the twentieth century - when, as will be seen, solar energy can be expected to contribute only a part - but perhaps a significant part - of our energy needs.

(LONG-TERM, ECONOMICS, SOLAR-PONDS, NEAR-TERM)

ST77 11122 STATE OF THE ART AND APPLICATIONS OF SOLAR TECHNOLOGY IN ISRAEL

Tabor, H., Belkin, G., (Scientific Research Foundation, Jerusalem), ASHRAE J., V 18:44-46, N11, Nov 1976, EDB-77:053867

Solar energy developments in Israel are discussed in terms of collectors, systems and simulation, auxiliaries, architecture and climate, testing and standards, cooling, heat pumps, and solar heating and cooling. Activities of Miromit, Ashkelon Metal-Products Ltd. are described briefly.

(RESEARCH-PROGRAMS)

ST77 11123 ROLE OF SOLAR ENERGY IN DEVELOPING COUNTRIES: PROSPECTS FOR MALI

Traore, C., (Lab de l'Energie Solaire, Bamako, Mali), Heliotech and Dev, Proc of the Int Conf, Dhahran, Saudi Arabia, Nov 2-6, 1975, Publ by Dev Anal Assoc, Cambridge, MA, V 2:641-658, 1976, In French

Research projects of the National Laboratory of Solar Energy in water heating, distillation, drying, cooking, water pumping, and theoretical investigations, are reviewed.

ST77 11124 FOR THE ADVANCEMENT OF SOLAR TECHNOLOGY: THE GERMAN ASSOCIATION FOR SOLAR ENERGY HAS BEEN FOUNDED

Urbanek, A., Sanit. Heizungstech., V 40:633, N11, 1975, EDB-77:047306, In German

On 17th October 1975, the German Association for Solar Energy (DGS) was founded in Munich by a circle of scientists, artisans, and journalists who had been active for several months. The DGS thought that it was an ideal union for the advancement of solar energy

utilization and for the speedy introduction of solar technology in the Federal Republic of Germany. The purpose of the Association is to promote the exchange of knowledge between science, industry, departments of sanitation and heating, architects and building contractors, as well as all the private individuals and groups interested in solar technology.

ST77 11125 UTILIZATION OF SOLAR ENERGY - 1. WHY AND HOW OF SOLAR ENERGY UTILIZATION

van Straaten, J.F., (Res Inst, Counc for Sci & Ind Res, Pretoria, South Africa), Proc of the Southeast Conf on Appl of Sol Energy, 2nd, Baton Rouge, LA, Apr 19-22, 1976, Sponsored by ERDA, Oak Ridge, TN, p. 2-10, 9 refs, 1976, CONF-760423
Avail:NTIS

Various aspects of solar radiation and of units using it, are reviewed. Design of collectors and building adapted to solar heating and cooling is discussed for differing climatic conditions.

(CLIMATIC-CONDITIONS, SOUTH-AFRICA)

ST77 11126 UTILIZATION OF SOLAR ENERGY - 4. SOLAR SPACE HEATING AND COOLING AND OTHER USES OF SOLAR ENERGY IN WARM COUNTRIES

van Straaten, J.F., (Res Inst, Counc for Sci & Ind Res, Pretoria, South Africa), Proc of the Southeast Conf on Appl of Sol Energy, 2nd, Baton Rouge, LA, Apr 19-22, 1976, Sponsored by ERDA, Oak Ridge, TN, p. 67-87, 17 refs, 1976, CONF-760423
Avail:NTIS

Direct and indirect systems, absorption cooling, photovoltaic, and photothermal power generation are discussed. Applications for cooling, crop drying, and distillation are illustrated.

ST77 11127 1977 A CRUCIAL YEAR FOR SOLAR ENERGY

Walton, J.D., Jr., (Georgia Inst of Technol, Atlanta, GA), Consult Eng, Barrington, IL, V 48:69-79, N3, 31 refs, Mar 1977

The author discusses how far ERDA will be able to exploit solar energy determined by the energy priorities that are set by the new Administration.

(ENERGY POLICY, ERDA, GOVERNMENT-POLICIES)

ST77 11128 PLASTICS IN ENERGY-CONSERVATION AND SOLAR HEATING (EN)

White, J.S., (Kalwall Corp, Manchester, NH), Plastics World, V 35:57, N3, 1977

No abstract available

ST77 11129 FLORIDA SOLAR ENERGY PROGRAM

Yarosh, M.M., (Florida Solar Energy Cent, Cape Canaveral, FL), Proc of the Annu ASME Symp, 16th: Energy Alternatives, Albuquerque, NM, Feb 26-27, 1976, Publ by ASME, New Mexico Sect, New York, NY, p. 125-130, 1976

The program of the Center is divided into three major categories, or divisions. These are Education and Information Systems, Research, Development and Demonstration, and Energy Systems Analysis. Programs within these divisions are so structured to allow a total solar energy service to the people of the Sunshine State. Sub-program areas include information dissemination, technical assistance, seminars, short courses, on-the-job training, briefings, publications, news-letters, displays, basic research, applied research, technological development, demonstrations, testing and standard work, energy utilization studies, economic and life-cycle cost studies, systems analysis work, identification of barriers to implementation, socio-economic impact evaluation, and legislative alternative activities.

(EDUCATION-INFORMATION, LIFE-CYCLE COST, SOCIO-ECONOMIC IMPACT)

ST77 11130 BARRIERS TO THE APPLICATION OF SOLAR ENERGY - THE FLORIDA EXPERIENCE

Yarosh, M.M., Beaty, K.D., (Florida Solar Energy Cent, Cape Canaveral, FL), Proc of the Southeast Conf on Appl of Sol Energy, 2nd, Baton Rouge, LA, Apr 19-22, 1976, Sponsored by ERDA, Oak Ridge, TN, p. 286-295, 2 refs, 1976, CONF-760423
Avail:NTIS

The Florida Solar Energy Center's activities in research, development, demonstration, information dissemination, legislative alternatives, and other actions that would increase and improve the application of solar energy within the State of Florida are described.

(LEGISLATIVE-ALTERNATIVES)

ST77 11131 SOLAR ENERGY: A CURRENT OVERVIEW. A COMPREHENSIVE LOOK AT THE SOLAR EVENTS OF 1976

Yellott, J.I., (Arizona State Univ., Tempe, AZ), Heat., Piping Air Cond., V 48:50-57, N7, July 1976, EDB-77:035255
An attempt is made to summarize what is happening today in the private and public sectors of the economy to bring about the economical use of solar energy.

(ECONOMICS, REVIEWS)

ST77 11132 QUALITY CATEGORY IN SOLAR ENGINEERING

Zakhidov, R.A., Panov, P.A., Sokolov, V.N., (Central Planning-Design Bureau of Scientific Instrument Building, Tashkent, USSR), Appl. Solar Energy, USSR, V 12:1-7, N3, 1976, EDB-77:060714, English Translation
The fundamentals of qualimetrics are briefly presented. The need for utilization of qualimetric methods in evaluation of the quality of various solar apparatus is shown. A hierarchic scheme for the quality properties of a radiant-energy concentrator is presented for discussion.

(QUALIMETRICS, OPERATION, PERFORMANCE)

ST77 11133 VIEW OF SOLAR ENERGY DEVELOPMENT

Zoerb, E.G., (Honeywell, Inc), SME Tech Pap Ser EM, 20 p., 1976, Manuf Manage Prod Oppor Conf, Dearborn, MI, May 25-27, 1976, Pap EM76-302
Two basic problems stand in the way of the rapid commercialization of solar energy. First, the geographic mismatch between the high solar insolation area of the southwest, the high heating requirements of the north, and the high population density of the east coast. Second, the high initial cost of the installed systems and the relatively slow economic payback through the displacement of conventional fuel. This paper presents a view of some developments underway to solve these problems and an assessment of the type of equipment, application and economics which are to be expected from the solar energy industry in the near future.

(ECONOMICS, COMMERCIALIZATION)

12,000 ECONOMICS AND LAW

ST77 12032 DEVELOPMENT OF ECONOMICAL SOLAR BATTERIES IN THE USA

Elektrotech. Z., B, V 28:740-741, N20, 21 refs, Oct 1976, EDB-77:041486, In German
No abstract available

(ECONOMICS, RESEARCH-PROGRAMS, ERDA)

ST77 12033 ENERGY RATE INITIATIVES. STUDY OF THE INTERFACE BETWEEN SOLAR AND WIND ENERGY SYSTEMS AND ELECTRIC UTILITIES

(MITRE Corp., McLean, VA), 106 p., Mar 31, 1977, FEA/G-77/127, PB-265 607/2WE
The implementation of alternative utility rate structure as required by the Energy Conservation and Production Act could easily impact the economics of future solar heating and cooling systems for buildings (SHACOB). It is expected that such variations in SHACOB economics may affect the design of these systems and their rate of market penetration and ultimately impact the backup energy load that they place on the utilities. This report discusses the problem in terms of seven key issues, and suggests seven possible actions government and regulatory bodies may wish to consider.

(ECONOMICS, GOVERNMENT)

ST77 12034 ENERGY RESEARCH AND DEVELOPMENT AND SMALL BUSINESS. PART 2A. APPENDIXES. SOLAR ENERGY (CONTINUED): THE SMALL BUSINESS AND GOVERNMENT ROLES. HEARINGS BEFORE THE SELECT COMMITTEE ON SMALL BUSINESS, UNITED STATES SENATE, NINETY-FOURTH CONGRESS, FIRST SESSION, OCTOBER 8, 22, AND NOVEMBER 18, 1975

(Select Committee on Small Business, Washington, DC), 1976, EDB-77:049871
This volume contains relevant materials received by the Senate Small Business Committee since publication of the record of its hearings on Energy Research and Development and Small Business: Part 2/ Solar Energy (Continued): The Small Business and Government Roles. The information is presented as Appendixes X through XIII, namely: X. Report by Angus McDonald, consultant to the Midwest Electric Consumers Association: "Solar Energy in Washington,"

July 1976. XI. Staff report by Frank M. Shooster, Antioch College, and former staff asst., Senate Small Business Committee: "The Potential Impact of Solar Energy on U.S. Energy Requirements," August 1976. XII. Additional legislation on alternative energy policy and systems in the form of two bills introduced by Sen. Gaylord Nelson: (1) the supplemental energy planning and Policy Act of 1976, S. 3680/ and (2) The Family Farm Energy Conversion Act, S. 3714. XIII. Article by Amory B. Lovins. British Representative, Friends of the Earth, Ltd.: "Energy Strategy: The Road Not Taken" from Foreign Affairs, October 1976 (reprinted by permission)/ (for abstract of Lovins article, see EAPA 3:566).

(ENERGY-POLICY, FINANCING, LEGISLATION)

ST77 12035 JOB CREATION THROUGH ENERGY CONSERVATION. A SOLUTION TO A CRISIS

(Action Associates, Inc., Bridgeport, CT), 125 p., Mar 1, 1977, OEO-LN-1752, PB-265 295/6WE
The report is a proposal for a project that calls for the planning and creation of a prototype organization which will be the initial effort in a large-scale national program designed to effect a substantial reduction in energy consumption through a massive program of weatherization and other energy-conservation measures. This will be done by the development of alternate-energy businesses emphasizing creation of jobs for the poor and near-poor and by making energy conservation affordable for these and other income groups.

(WEATHERIZATION, ECONOMICS)

ST77 12036 NEW YORK VERSION OF ERDA ENVISIONS KEY ROLE IN BOLSTERING STATE ECONOMY

Energy Res. Rep., V 2:8-11, N12, Dec 1976, EDB-77:054874
New York has established a state Energy Research and Development Authority to interact with the Federal ERDA in developing energy proposals and bringing the state its fair share of research and development money. Economic considerations will have top priority in matters of energy pricing and development of private industry. The chairman of the state's largest utility, the Power Authority, serves as a member of the new organization. New York also has a counterpart to the Electric Power Research Institute (EPRI). After operating for less than one year, the Authority is presently involved in a dairy farm wind power project that will tie in with the area electric grid and a solar demonstration project. Emphasis will be placed on alternative energy sources, conservation, efficiency, and environmental effects of energy technology. Tax-exempt bonds are issued for pollution control, mainly scrubbers, but not for generating capacity. It is anticipated that financing will be available for solar and efficiency equipment also. The New York Authority is not as broad as that of California, which also handles siting and conservation planning. Regional Authorities are recommended because of varying situations around the country which should be introduced into national ERDA planning at an earlier stage than is the current practice.

(ECONOMICS, ENERGY-CONSERVATION, ENERGY POLICY, ENVIRONMENTAL-EFFECT, RESEARCH-PROGRAMS, TAXES, WIND)

ST77 12037 SOLAR ENERGY: A $10 BILLION INDUSTRY BY THE YEAR 2000

Commer. Am., V 2:4-7, N2, Jan 17, 1977, EDB-77:054964
Economic analysis indicated that solar energy, with the advantages of being free and inexhaustible, is now competitive with electricity in water and space heating for many areas of the country. It is possible for solar energy to heat 15 percent of the Nation's buildings by the year 2000, thus becoming a $10 billion industry and providing 7 percent of the Nation's energy. Solar collector systems, which can now be installed at $20 per square foot, are competitive with electricity, but a cost reduction to $15 per square foot will make them competitive with oil and electric heat pumps. New residences in thirteen cities were selected for the analysis to give variation in climate and fuel costs. An 8.5 percent financing was assumed, as were standards of size, construction, insulation, and taxes. It was determined that a cost reduction to $10 per square foot will make solar systems competitive with electric systems everywhere except Seattle, with oil in all cities, and with gas in nine of the cities. Compared to electric systems, positive savings would be made in one to four years, while years to payback would be 9 to 14. Similar calculations were made for heat pumps, oil, and gas. Grants totaling $5 million have been authorized by the Department of Housing and Urban Development to allow builders to install solar systems in 1550 housing units and gain the experience while public familiarity is developed. In addition, ERDA and the National Science Foundation are authorizing over 200 demonstration projects in public buildings. Other solar projects involve power generation and irrigation.

(COMPARATIVE-EVALUATIONS, ECONOMICS, FEASIBILITY-STUDIES, GOVERNMENT POLICIES, IRRIGATION, LIFE-CYCLE COST, RESEARCH-PROGRAMS)

ST77 12038 SOLAR ENERGY: AN INDUSTRY IN SEARCH OF A MARKET

Energy, Stamford, CT, V 1:12-15, N4, 1976, EDB-77:036251
Although the government and nearly 1000 companies are investing heavily in solar projects, installations of solar equipment are primarily limited to demonstrations. The commercial solar equipment market is growing rapidly as new solar buildings and retrofitting concepts

are incorporated, but the new housing market has not developed accordingly because of high capital costs. Of further concern to homeowners are questions of resale values and insurance for solar-equipped houses. With 25 percent of U.S.-produced energy going for space heating and cooling, the potential market is ready for economically and legally feasible equipment. Market projections indicate that low-temperature collectors for swimming pools are selling best, with water heaters moving up rapidly. Retrofitting for hot water collectors will be simpler and cheaper than retrofitting for space heating and cooling. There is a need for new utility rate structures to encourage the use of solar equipment. While most of the companies in the solar business are small and produce custom equipment, ERDA is offering stimulation through retrofitting and demonstration programs of public buildings and development. Sixteen states have recent legislation dealing with the development and use of solar energy equipment.

(LEGAL-ASPECTS, LEGISLATION, MARKET, ECONOMICS)

ST77 12039 UTILITIES AND SOLAR ENERGY: WILL THEY OWN THE SUN

People Energy, p. 2-4, Oct 1976, EDB-77:036254

At least 33 electric utilities nationwide are presently conducting or planning to undertake some 220 individual solar research projects according to a survey recently taken by the Electric Power Research Institute. According to John Cummings, project manager for EPRI's solar heating and cooling program, the survey "represents the first step in developing an industry data base in anticipation of more solar research by electric power companies. The significance of the survey was that it showed the growing interest of the electric utilities in examining the potential impact of solar energy for heating and cooling." Demonstration homes retrofitted or constructed from scratch with solar heating and/or cooling systems are perhaps the most common form of utility solar research now underway. A second major area of utility involvement is the rental of solar heating and cooling equipment to their customers. The third major interest area of the Nation's private utilities is the leasing of desert land to use for generation of electricity through centralized solar thermal plants. Some potential advantages of utility involvement in solar development are (1) investment in equipment in quantities large enough to stimulate mass production/ (2) loan capital for solar systems that might not be available to low-income citizens/ and (3) solar systems could serve to lessen demand pressures on other generating equipment. Possibly the most significant argument against utility involvement in the solar energy field is that the industry is not seriously interested in pressing solar development but only in getting their hands into the pot while they continue to play out their fossil-fuel and nuclear options into the first part of the next century.

(FINANCING, GOVERNMENT POLICIES, MONOPOLIES, ECONOMICS)

ST77 12040 BARRIERS TO, AND INCENTIVES FOR, THE WIDESPREAD UTILIZATION OF SOLAR ENERGY: A FRAMEWORK FOR ANALYSIS

Bezdek, R.H., (US ERDA, Washington, DC), Proc of the Southeast Conf on Appl of Sol Energy, 2nd, Baton Rouge, LA, Apr 19-22, 1976, Sponsored by ERDA, Oak Ridge, TN, p. 264-272, 1976, CONF-760423
Avail:NTIS

Major objectives of this paper are to: (1) present a general overview of the solar barriers and incentives problem, (2) develop a conceptual framework for analysis of the many issues involved, (3) summarize, where appropriate, some of the empirical results available pertaining to these issues, and (4) describe in brief the U.S. Energy Research and Development Administration (ERDA) program being developed to address critical solar barriers and incentives issues.

(ECONOMICS, SOCIOLOGICAL-EFFECTS, ERDA)

ST77 12041 CONSERVATION: THE ONLY WAY OUT OF THE ENERGY SHORTAGE MAZE

Conta, L.D., (Univ of Rhode Island, Providence, RI), Prof Eng, Washington, DC, V 46:40-43, N2, Feb 1976

What the United States sorely needs to meet its energy challenge is a real conviction on the part of both the public and our government and industry leaders that the problem is both serious and urgent and an earnest commitment to take the drastic action necessary to bring it under control. A program of drastic energy conservation is called for, fully backed by Congress and the Administration to buy the time needed to develop alternate energy sources.

(UNITED-STATES, PUBLIC, GOVERNMENT, INDUSTRY)

ST77 12042 WHAT THE NEW WHITE HOUSE CAN DO ABOUT ENERGY

Falck, E., Smartt, L.E., Public Util. Fortn., V 98:17-21, N12, Dec 2, 1976, EDB-77:036170

The authors have compiled a list of essential objectives they believe should be followed: intensified energy conservation and elimination of energy waste/ accelerated development of solar energy to replace depletable fossil fuels/ and accelerated conversion of large industrial and utility power plants from oil and natural gas to coal or nuclear energy. The new White House has a splendid opportunity to address the energy issues left unresolved by the outgoing administration. The authors are hopeful that the new administration and their energy advisors will profit from an analysis of the mistakes made by the Nixon and Ford administrations in

the energy field - mistakes in setting goals for achieving energy self-sufficiency, mistakes in organization, in staffing, and in communication with the public. They feel one of the first interim steps that President Carter can take is to work cooperatively with the Congress on legislation to eliminate the tortuous delays involved in granting authorization to new energy projects undertaken by private industry / they refer especially to the siting of new electric power generating facilities/ approval of right-of-ways for high voltage electric transmission lines and high-pressure natural gas pipelines/ approval of new crude oil and products lines and coal slurry pipelines/ and siting of LNG terminal and regasification facilities. The activities and objectives of a Materials Policy Commission (subsequently known as the Paley Commission) established by President Truman in 1951 are reviewed. Finally, the authors comment on international interdependence and conclude that a concept of total self-sufficiency should be rejected.

(ACCELERATED-DEVELOPMENT, ENERGY-CONSERVATION, GOVERNMENT POLICIES, INTERNATIONAL-AGREEMENTS, LEGISLATION)

ST77 12043 ENERGY DEMAND AND COST/BENEFIT ANALYSIS

Gibbons, J.H., (Univ of Tennessee, Knoxville, TN), Energy and the Environ Cost-Benefit Anal, Proc of a Conf, Georgia Inst of Technol, Atlanta, GA, June 23-27, 1975, Publ by Pergamon Press, Elmsford, NY, p. 71-79, 1976

Cost/benefit analysis is a method of accounting that attempts to introduce all costs and benefits into the decision process. It departs significantly from traditional private market decisions since it attempts to include externalities and non-market factors such as total social welfare. When applied to alternative ways to relieve the current U.S. energy problem this kind of analysis points to reduction of demand growth (conservation) as more cost-effective than most supply growth alternatives. Ways of energy conservation in various fields are pointed out.

(SOCIAL-WELFARE, ENERGY-CONSERVATION, ECONOMICS)

ST77 12044 ENERGY: THE STATES' RESPONSE. ENERGY LEGISLATION, JULY-DECEMBER 1975. VOLUME III

Jones, R.G., Pelster, J., (National Conference of State Legislatures, Washington, DC), Feb 1976, PB-252221, EDB-77:036161
Avail:NTIS HC$13.00

This publication contains categorized text copies of energy legislation passed by state legislatures in calendar year 1975. The first two volumes were published in August, 1975, and contained 205 bills passed in the January-July 1975 period. This third volume contains an additional 118 bills covering the period through December, 1975.

(ENERGY-CONSERVATION, ENERGY POLICY, ENVIRONMENTAL-EFFECTS, GOVERNMENT POLICIES, LAWS)

ST77 12045 ENERGY AND THE ENVIRONMENT COST-BENEFIT ANALYSIS

Karam, R.A., ed., Morgan, K.Z., ed., (Georgia Inst of Technol, Sch of Nucl Eng, Atlanta, GA), Energy and the Environ Cost-Benefit Anal, Proc of a Conf, Georgia Inst of Technol, Atlanta, GA, June 23-27, 1975, Publ by Pergamon Press, Elmsford, NY, 695 p., 1976

Thirty-five papers by various authors are presented. The topics discussed are: energy resources and projections fusion power, solar energy for electricity, energy demand, decision making, nuclear, safety, alternative sources, fission reactors and environment, uranium mining and processing, nuclear fuel cycle, radiation exposures, plutonium recycle, radioactive waste, fossil fuels, coal in power generation, chemical pollutants, genetic scales, reactor safety, probabilistic methods in cost-benefit analysis, matrix model for nuclear plants cooling systems, decision analysis, utilities in nuclear plants financing, ecosystem tolerance limits, environmental criteria, EPA standards, and the Nuclear Regulatory Commission.

(CONFERENCE, PROCEEDINGS)

ST77 12046 SOLAR CONSPIRACY: THE $3,000,000,000,000 GAME PLAN OF THE ENERGY BARONS' SHADOW GOVERNMENT

Keyes, J., (Morgan and Morgan, Dobbs Ferry, NY), 1975, EDB-77:036250, PC$3.95

The author, Chairman of the Board of International Solarthermics Corp. of Nederland, CO, presents some very provocative questions and comments in this analysis of solar energy development in the U.S. - and in the process, the analysis pervades the whole muddled energy picture. Mr. Keyes' frustration and concern results essentially from the following: (1) his company invented and developed a backyard solar furnace with collector space approximately 100 ftSas (about 10 times smaller than most other systems to date)/ (2) the furnace was tested, made a production-ready item, and was to be made and marketed by many independent manufacturers licensed under a patents-pending arrangement and in competition with each other/ and (3) instead of being greeted with "huzzahs" as a breakthrough product, the furnace "seemed to act like a red-flag stimulus designed to prompt the anger of the people already working in the field of solar energy research." It is (3) and the attacks by "learned" PhD's and other scientists and engineers that apparently inspired this book - indeed, Mr. Keyes attempts to analyze the motives behind these attacks, first pointing out that respected scientists had been wrestling with the problem for years and could not build a practical system with less than 1000 FtSAs of solar collector. He states further that many attackers suspended final

judgement until they had visited the research facility and examined the data and collection methods/and that each who took the time to investigate carefully became a "convert" and advocate of the system. Mr. Keyes' analysis of the forces at play behind his charge of "conspiracy" - that big business, aided unwittingly by governmental agencies, is inhabiting rapid development of solar energy - indeed provides food for thought for those who should scrutinize the whole energy ball game.

(ECONOMICS, ENVIRONMENTAL-EFFECTS, GOVERNMENT POLICIES, RESEARCH-PROGRAMS, LEGISLATURE)

ST77 12047 CONGRESSIONAL PERSPECTIVE

McCormack, M., (House Science and Technology, Washington, DC), Capturing the Sun Through Bioconversion, EDB-77:053812
The congressional support given to research, development and demonstration in the conversion of wastes to energy and fuels and the production of fuels from biomass is outlined.

(BIOMASS)

ST77 12048 DEMAND ELECTRIC RATES: A NEW PROBLEM AND CHALLENGE FOR SOLAR HEATING

Mills, G., (CMK Industries, Englewood, CO), ASHRAE J., V 19:42-44, N1, Jan 1977, EDB-77:054945
Designers of solar heating systems are now faced with dealing with public utilities since electric heat must almost certainly be considered as a backup system. Public utilities are realizing the impact this will have on their operation and are beginning to change their rate structures to protect themselves and their existing customers. The author suggests that, in order for solar energy to become a viable energy alternative, both the industry and the technology have an extensive evolutionary process to go through. An example is cited of the Public Service Company of Colorado obtaining permission to charge all new residential customers using electricity as their primary source of heat or as their primary backup source a demand/energy rate (Der). PSCO's residential demand/energy rates, which became effective Feb. 9, 1976, are based on a different concept than the old residential declining block rates. Data are presented comparing electrical energy costs for 10,000 Btu/degree day all-electric and 70 percent solar-heated homes in Denver.

(ECONOMICS, PUBLIC-UTILITIES)

ST77 12049 LESSONS FROM YESTERDAY FOR ENERGY PROJECTIONS OF TOMORROW

Mueller, K.W., (Deutsche Shell A.G., Hamburg, Germany), Abt. Wirtschaft und Wirtschaftspolitik, 16 p., 1976, CONF-760565-4, AED-CONF-76-148-005, U.S. Sales Only, In German
Methods previously used in the German Federal Republic for forecasting energy supplies and demand have proven to be inaccurate and require revision. As the development of the petroleum and natural gas industry shows, new energy sources were first underestimated, but once established, they were overestimated. Prediction of nuclear energy development is uncertain. The energy market, which is under increasing political influence, means an additional difficulty for the forecaster. In the future, energy projections should take the possible range of the future total economic development into consideration, should use realistic instead of "political" yield expectations as a basis for predicting the energy supplies, should continually compare the real development with the estimated development trend, and in case of deviation, should quickly adjust the predictions.

(GERMANY, POLITICAL-INFLUENCE, ECONOMIC)

ST77 12050 SOCIAL ASPECTS OF ENERGY CONSERVATION

Olsen, M.E., Goodnight, J.A., (Northwest Energy Policy Project, Portland, OR), 190 p., 1977, NEPP-I-3, PB-266 029/8WE
The report summarizes findings from existing social scientific studies of energy conservation attitudes and behavior, which in general show that the American public has thus far adopted only minimal conservation practices. It analyzes six strategies for implementing energy conservation programs, and concludes that informational and persuasive techniques are relatively worthless, that pricing and incentives can be quite effective for altering specific practices, and that governmental regulation and guidance can produce more extensive changes in energy consumption. Several possible social implications of energy conservation are examined, including quality of social life, socioeconomic equity, and the development of a conservation ethic, all of which could be affected by extensive energy conservation programs.

(INCENTIVES, GOVERNMENTAL-REGULATION, SOCIOECONOMIC)

ST77 12051 IMPACT OF ALTERNATIVE INCENTIVES ON THE UTILIZATION RATE OF SOLAR ENERGY SPACE CONDITIONING AND WATER HEATING: 1975-2000

Petersen, H.C., (Utah State Univ, Logan, UT), Proc of the Southeast Conf on Appl of Sol Energy, 2nd, Baton Rouge, LA, Apr 19-22, 1976, Sponsored by ERDA, Oak Ridge, TN, p. 279-285, 1 ref, 1976, CONF-760423
Financial incentives are proposed to accelerate the use of solar energy for heating, cooling, and water heating. Among the most frequently mentioned are sales and property tax exemptions, tax deductions, tax credits, rapid amortization, and interest rate subsidies. A computer

simulation model is used to estimate the effects of alternative incentives on the rate of solar energy utilization. It is determined that interest rate subsidies have the most significant impact, while sales tax exemptions make little difference.

(COMPUTER-SIMULATION, TAX-EXEMPTIONS, TAX-CREDITS, INTEREST-RATE-SUBSIDIES, ECONOMICS)

ST77 12052 A SIMPLIFIED EQUILIBRIUM MODEL OF THE U.S. ENERGY-ECONOMIC SYSTEM AND ITS USE IN COMPARING ALTERNATIVES

Plass, H.J. Jr., (Miami, University, Coral Gables, FL), In World Hydrogen Energy Conference, 1st, Miami Beach, FL, Mar 1-3, 1976, Proceedings, University of Miami, Coral Gables, FL, Pergamon Press, New York, NY, V 3:3C-75-3C-98, 1976, A77-33326 14-44, A77-33421

A simplified model of the U.S. energy-economic system is developed using published data on energy flows, labor employed and dollar flows. The energy system, usually divided into the sectors in industry, electric power, residential-commercial and transportation is restructured into a three-sector model including extraction and production of energy resources, production of goods and services and consumption of fuels, goods and services. Effects on fuel used, employment and standard of living of various alternatives are examined, including high prices of imported fuel, technological improvements, solar energy for space and water heating and hydrogen fuel for transportation.

(MATHEMATICAL MODELS, ENERGY-TECHNOLOGY, U.S.)

ST77 12053 MANAGING THE SOCIAL AND ECONOMIC IMPACTS OF ENERGY DEVELOPMENTS

Reiff, I.S., (Cantaur Management Consultants, Washington, DC), 171 p., July 1976, TID-27184

The purpose of this handbook is to provide local (as well as regional, state and Federal) officials with guidance regarding how they most effectively may assess, plan and manage the social and economic impacts of energy developments.

(HANDBOOK)

ST77 12054 ECONOMIC COMPETITIVENESS OF SOLAR ENERGY WITH CONVENTIONAL FUELS AND ELECTRICITY

Saif-Ul-Rahamn, M., (Pak Counc of Sci & Ind Res, Labore, Pakistan), Sol Energy, V18:577-579, N6, 8 refs, 1976

An equation is given to calculate the collector area required for a specific application. This relation is graphically shown from which the required collector area can be easily determined provided the insolation at the place and the efficiency of the collector and the machine is known.

(MATHEMATICAL MODELS)

ST77 12055 COMPARATIVE SURVEY OF SELECTED PLANNING METHODS IN ENERGY ECONOMY

Schmitz, K., (Kerforschungsanlage Juelich G.m.b.H., Germany, F.R., Programmgrupe Systemforschung und Technologische Entwicklung, Germany), 35 p., 1976, CONF-760565-5, AED-CONF-76-148-004, U.S. Sales Only, In German
Avail:ERDA, P.O. Box 62, Oak Ridge, TN, 37830, Attn: TIC

Some general remarks on planning are followed by an outline of selected methods of planning: mathematical-statistical methods, intuitive methods, structuring methods, optimization methods, and input-output technique. On the basis of these already-traditional methods, a model is described which takes into account the interactions of the complex system energy economy with its environment. The solution, or rather the application, of each method must be determined by the special set of problems to be dealt with.

(MATHEMATICAL-STATISITCAL, INTUITIVE-METHODS, STRUCTURING-METHODS, OPTIMIZATION, INPUT-OUTPUT, ENVIRONMENT)

ST77 12056 ECONOMICS OF SOLAR COLLECTORS, HEAT PUMPS AND WIND GENERATORS

Smith, G.E., (Univ of Cambridge, Cambridge, NJ), 1973, EDB-77:060703

The paper is intended as an economic analysis of the systems currently available for utilization in an autonomous house. The methods used are those of micro-economic investment analysis, and an appendix has been included which discusses the appropriate rate of interest. The first part of the paper reviews a little history to note some usable data and to have some of the roots of the motivation for this research. The second part concerns itself with current costs and tries to divide the costs into components so that high cost problem areas can be highlighted. The last section dealing with auxiliary heat supply offers a suggestion for an integrated system, which although technically feasible appears to be untried.

ST77 12057 ENERGY CONSERVATION AND THE LAW

Thompson, G.P., (Environmental Law Inst., Washington, DC), ASHRAE J., V18:16, N11, Nov 1976, EDB-77:054824

The author hopes that legislatures will do three things: (1) offer regulations and incentives to traditional conservation investments in buildings, (2) encourage public utility commissions

to adopt more economical pricing strategies and (3) develop flexible, performance-oriented rules and standards for zoning and building officials so they will not disapprove solar energy designs simply because they are unfamiliar. These three actions could do more to encourage solar energy development than most of the 200 laws that were examined. This monthly roundup of energy conservation law, particularly as it affects buildings, indicates that more than 200 pieces of legislation have been formulated, the majority not enacted upon. The author feels that most legislation presented was not presented seriously or was presented prematurely. He cites two problems of solar energy development: (1) it is too expensive, and (2) even with a storage system, a homeowner needs a connection to existing public utility lines for a backup system.

(ECONOMICS, LEGISLATION)

ST77 12058 TWO ENEMIES OF THE INDUSTRIAL DEVELOPMENT OF SOLAR ENERGY: SIMPLICITY AND ECONOMY

Touchais, M., (Comples, Marseille, France), Heliotech and Dev, Proc of the Int Conf, Dhahran, Saudi Arabia, Nov 2-6, 1975, Publ by Dev Anal Assoc, Cambridge, MA, V 1:135-143, 1976, In French
Problems of solar techniques are discussed in view of space heating utilization of solar energy. Calculations of insolation and useful heat are presented emphasizing a noncommercial approach.

(ECONOMICS)

ST77 12059 FLOWCHART FOR AN ACCELERATED DEVELOPMENT OF INDUSTRIAL APPLICATIONS OF SOLAR ENERGY

Touchais, M., (COMPLES, Marseille, France), Heliotech and Dev, Proc of the Int Conf, Dhahran, Saudi Arabia, Nov 2-6, 1975, Publ by Dev Anal Assoc, Cambridge, MA, V 2:605-608, 1976, In French
A program of applied research is proposed and step by step approach to practical solutions is outlined.

ST77 12060 PLAN FOR THE DEVELOPMENT AND IMPLEMENTATION OF STANDARDS FOR SOLAR HEATING AND COOLING APPLICATIONS INITIAL REPORT

Waksman, D., Pielert, J.H., Dikkers, R.D., Streed, E.R., (NBS, Washington, DC), Aug 1976, NBSIR--76-1143, EDB-77:053825
NTIS $4.50
This plan contains overviews of the various types of standards that are presently available, how standards are normally developed in the United States and how these standards are normally utilized by the building regulatory system as background information. Recommendations are included regarding actions and steps that should be taken to identify available and needed solar standards, current activities in both the public and private sectors related to solar standards are discussed, activities related to the implementation of solar standards are presented/ and tables which can be used to coordinate the development and implementation of standards for heating and cooling applications are included.

13,000 THERMAL POWER

ST77 13055 ASSESSMENT OF ENERGY STORAGE SYSTEMS SUITABLE FOR USE BY ELECTRIC UTILITIES FINAL REPORT

(Public Service Electric and Gas Co., Newark, NJ), 40 p., July 1976, EPRI-EM-264(V.1)
Avail:ERDA, P.O. Box 62, Oak Ridge, TN, 37830, Attn: TIC
This is the final report of "An Assessment of Energy Storage Systems Suitable for Use by Electric Utilities." It is separated into three volumes: Vol. 1 contains the Executive Summary and Chapter 1, Overall Summary of Assessment; Vol. 2 contains Chapters 2 through 7 and associated appendices, the essential elements of the report; Vol. 3 is a separate topical report on hydro pumped storage. Selected material from Vol. 3 is included in Vol. 2. The systems include thermal, hydro pumped, compressed air, flywheel, electric batteries, hydrogen, and superconducting magnetic.

(OVERVIEW)

ST77 13056 ASSESSMENT OF ENERGY STORAGE SYSTEMS SUITABLE FOR USE BY ELECTRIC UTILITIES FINAL REPORT

(Public Service Electric and Gas Co., Newark, NJ), 469 p., July 1976, EPRI-EM-264(V.2)
The systems evaluated include thermal, hydro pumped, compressed air, flywheel, electric batteries, hydrogen and super-conducting magnets.

St77 13057 SOLAR ENERGY SOLAR-THERMAL: STOKING THE BOILERS WITH SUNSHINE

Mosaic, V5:14-15, N2, 1974, EDB-77:041496

A brief look is taken at the possibilities of central-station generation of electric power by solar energy. The flat plate and central receiver concepts are compared.

(CENTRAL RECEIVERS, PARABOLIC-REFLECTORS, THERMAL POWER, TOTAL-ENERGY-SYSTEMS)

ST77 13058 SOLAR ENERGY STORAGE: MAKING H WHILE THE SUN SHINES

Mosaic, V5:23, N2, Apr 1974, EDB-77:047343
The production of hydrogen by solar and wind power plants as a means of energy storage is mentioned.

(HYDROGEN-PRODUCTION, WIND, THERMAL-POWER)

ST77 13059 SOLAR THERMAL ENERGY CONVERSION PROGRAM: SUMMARY REPORT

(ERDA, Washington, DC), Oct 1976, ERDA—76-159, EDB-77:053814
NTIS $5.00
Project summaries are given for contracts pertaining to the central receiver power plant, 5 mwth solar thermal test facility, total energy systems, distributed collector systems, hybrid systems, research and development, and program application and support.

(RESEARCH-PROGRAMS, THERMAL-POWER, TOTAL-ENERGY-SYSTEMS)

ST77 13060 SOLAR TOTAL ENERGY PROGRAM PLAN

(Sandia Labs., Albuquerque, NM), 43 p., Aug 1976, SAND-76-0167(Rev.)
The goal of the Solar Total Energy Program is to have by the end of FY 82 a total installed capacity of 30 MW, consisting of approximately 5 MW of electrical capacity and 25 MW of thermal capacity. These systems are to include differing technical designs and be applied to a variety of electrical and thermal loads in a number of different locations. This Program Plan describes a coordinated research and development effort necessary to achieve this goal.

(RESEARCH-DEVELOPMENT, OVERVIEW)

ST77 13061 THREE COMPANIES COMPETE IN DESIGNING 10-MW PILOT PLANT

Anon, Mach Des, V49:30-32, N3, Feb 10, 1977
Competing designs are being considered for a 10-MW solar/electric pilot plant to be constructed in the California desert. The principal differences among the contractors' proposals are their heat storage systems. Two propose the use of sensible-heat systems and a third proposes a latent-heat storage system. As a cost cutting step, all contractors will use a heliostat constructed of silvered float glass rather than exotic mirrors.

(CALIFORNIA, STORAGE, HELIOSTAT, THERMAL-POWER)

ST77 13062 PRODUCTION OF ELECTRICITY THROUGH THERMODYNAMIC CONVERSION OF SOLAR ENERGY - 10 MWE PROJECT

Abatut, J.L., (CNRS, Laboratoire D'Automatique Et D'Analyse Des Systemes, Toulouse, France), Revue De L'Energie, V28:230-238, Apr 1977, A77-32591, In English and French
The design of a french solar energy plant planned for construction in 1982 is described. A large number of 7M x 7M heliostats (Motor-driven mirrors) will be arranged on the ground so as to concentrate and reflect the sun's image. A boiler, placed on top of a 100 to 200-meter high tower, will receive the solar flux concentrated by the bank of heliostats. Parameters for optimizing tower design are discussed. The heliostats' reflecting material, support structure, drive mechanism, and servos for alignment are described. A prototype is scheduled to be put into service in 1980.

(THERMODYNAMIC-EFFICIENCY, STORAGE, FRANCE, HELIOSTATS, DESIGN-ANALYSIS)

ST77 13063 RANKINE CYCLE ENERGY CONVERSION SYSTEM DESIGN CONSIDERATIONS FOR LOW AND INTERMEDIATE TEMPERATURE SENSIBLE HEAT SOURCES

Abbin, J.P. Jr., (Sandia Labs., Albuquerque, NM), 18 p., SAND-76-0363 E(29-1)-789, N77-21699
Avail:NTIS
Design considerations are described for energy conversion systems for low and intermediate temperature sensible heat sources such as found in geothermal, waste heat, and solar-thermal applications. The most cost effective designs for the applications studied did not require the most efficient thermodynamic cycle, but that the efficiency of the energy conversion hardware can be a key factor.

(GEOTHERMAL, THERMAL-POWER)

ST77 13064 NEW METHOD FOR COLLECTOR FIELD OPTIMIZATION

Abdel-Monem, M.S., Hildebrandt, A.F., Lipps, F.W., Vant-Hull, L.L., (Univ of Houston, TX), Heliotech and Dev, Proc of the Int Conf, Dhahran, Saudi Arabia, Nov 2-6, 1975, Publ by Dev Anal Assoc, Cambridge, MA, V 1:373-387, 5 refs, 1976

A comprehensive computer simulation program is used to optimize heliostat locations in a collector field and to compute the fraction of the solar energy which actually strikes the receiver. The new optimization method makes a 10 percent improvement over previous approximations.

(COMPUTER-SIMULATION, HELIOSTATS, THERMAL-POWER)

ST77 13065 TOTAL ENERGY SYSTEMS: SOLAR ENERGY PROGRAM SEMI-ANNUAL REVIEW, JULY 1976

Alvis, R.L., San Martin, R.L., (Sandia Labs., Albuquerque, NM), July 1976, SAND--76-5758, EDB-77:060549
NTIS $7.50
Reviews are presented on the ERDA-New Mexico irrigation project, total energy program, solar total energy campus study, solar total energy test facility (including operating experience with parabolic cylindrical collector field), solar total energy project management, and mirror materials and selective optical coatings.

(HELIOSTATS, RESEARCH-PROGRAMS, TOTAL-ENERGY-SYSTEMS)

ST77 13066 PROBLEMS ON ENERGY STORAGE IN SOLAR POWER STATIONS

Aparisi, R.R., Teplyakov, D.I., Appl. Solar Energy, USSR, (Engl. Transl.), V12:1-7, N2, 1976, EDB-77:060551
An account is given of the basic prerequisites for the development of diurnal, seasonal, and annual storage systems for the energy generated by solar power stations. Procedures are outlined for the processing of actinometric data, obtained over many years, as a basis for estimating the size of the energy storing systems. Existing types of such systems are appraised from the standpoint of their suitability for solar power stations.

(DIURNAL, SEASONAL, ANNUAL, ACTINOMETRIC-DATA, THERMAL-POWER)

ST77 13067 SOLAR HEATED DEVICE

Bash, D.G., U.S. Patent 4,002,032, Jan 11, 1977, EDB-77:060688
A solar heated device including a conduit for expansion and flow of gases, and a solar light collector for heating the gas in the conduit, is provided with a gas turbine that is driven by the gas as it expands as a result of the solar heating. The conduit may include an inlet for introducing air, or an inlet for introducing water spray (later steam), or both, thus supplying the gas which is heated and expanded in the conduit to drive the gas turbine. The light collector is preferably a parabolic reflector that directs sunlight on the conduit in order to heat and expand the gas therein. The turbine ordinarily drives an electric generator.

(PARABOLIC-REFLECTORS, HEAT ENGINES, PATENTS, THERMAL-POWER)

ST77 13068 POWER PLANT WITH SOLAR POWER GENERATOR

Blake, F.A., German Patent 2,444,978/A, Apr 3, 1975, EDB-77:041498, In German
It is proposed to supplement a hydro power station by a solar power generator consisting of an array of mirrors, which focus the solar radiation producing steam at the focus. The steam drives a turbine.

(ELECTRIC-GENERATION, PATENT, THERMAL-POWER)

ST77 13069 ONE MW//t//h BENCH MODEL CAVITY RECEIVER STEAM GENERATOR

Blake, F.A., Tracey, T.R., Walton, J.D., Bomar, S., (Martin Marietta Aerosp, Denver, CO), Sol Energy, V18:513-523, N6, 1976
Design of a bench model steam generator having geometric and thermal characteristics of the full-scale steam generator to be used in energy collection-conversion modules of a 100 MW//e solar energy conversion power plant scaled for operation in the Centre National de la Recherche Scientifique solar furnace at Odeillo, France, was a major element of the Solar Power System and Component Research Program. The planned follow-up program to fabricate the bench model steam generator, to provide required instrumentation-control-adaptation equipment and to perform checkout testing is being performed during 1975.

(DESIGN-REVIEW, THERMAL-POWER)

ST77 13070 SOLAR THERMAL CONVERSION MISSION ANALYSIS

Blond, E., Bos, P.B., (Aerosp Corp, El Segundo, CA), AIAA/AAS Sol Energy for Earth Conf, Pap, Los Angeles, CA, Apr 21-24, 1975, Publ by AIAA, New York, NY, 10 p., 1975, Pap 75-619
Alternative solar thermal conversion system concepts operating in realistic operating environments have been evaluated. Based upon the comparative technical and economic assessments of these alternative solar concepts, the central receiver system operating in an

intermediate or load-following mode has tentatively been identified as the preferred concept. This central receiver power plant appears to be economically competitive with conventional power plants in the 1990 time period. A preliminary market capture potential has also been estimated for this preferred concept.

(SOUTHWESTERN UNITED-STATES, ECONOMIC, MARKET POTENTIAL, THERMAL-POWER)

ST77 13071 CERAMIC MATERIALS FOR SOLAR THERMAL ELECTRIC-POWER GENERATION

Bomar, S.H., Poulos, N.E., (Georgia Inst Technol, Atlanta, GA), American Ceramic Society Bulletin, V 56:322, N3, 1977
No abstract available

ST77 13072 PRELIMINARY REPORT ON SIMULATION OF A HELIOSTAT FIELD

Bouyssou, G., Giraud, A., Vialaret, G., (Grimes, W.J. and Co., Hingham, MA), Rapport Provisoire Sur La Simulation D'Un Champ D'Heliostats, Toulouse, Natl. Scientific Res. Center, 27 p., July 1975, Sponsored by ERDA, ERDA-TR-158, N77-19782, Transl. Into English
Avail:NTIS
Structuring with specialized subprograms provides a very high degree of flexibility depending on the acquisition of increasingly accurate data for the selected site, the mechanical and optical design of the mirrors, the data on solar radiation, the tower and boiler, the number of towers, and random disturbances. These data can be integrated into any stimulation in order to obtain results which come closer and closer to reality.

(ENERGY POLICY, MATHEMATICAL-MODELS)

ST77 13073 DESIGNING AND SITING SOLAR POWER PLANTS

Bradley, W.J., (Burns & Roe Inc, Woodbury, NY), Consult Eng, Barrington, IL, V 48:80-84, N3, 4 refs, Mar 1977
The author stresses that site and design depend on whether the facility will be used as a peaking plant, intermediate plant, or as a base load plant. A flow chart showing the various methods of solar energy collection, conversion, and application to supply electricity requirements is presented. A schematic flow diagram of a distributed solar thermal power system is illustrated.

(SITE-SELECTION, FLOW-CHART, THERMAL-POWER)

ST77 13074 TEMPERATURE OPTIMIZATION FOR POWER PRODUCTION OF INFINITE HEAT TRANSFER SOLAR ABSORBERS

Cheema, L.S., Singh, P., (Punjab Agric Univ, Ludhiana, India), Heliotech and Dev, Proc of the Int Conf, Dhahran, Saudi Arabia, Nov 2-6, 1975, Publ by Dev Anal Assoc, Cambridge, MA, V 1: 194-204, 6 refs, 1976
It is found that the ratio of the absorber to the stagnation temperatures completely predicts the thermal performance of collection systems. The result of the analysis is used to obtain the optimum outlet temperature of heat transfer fluid for maximum Carnot efficiency. Simple numerical calculations optimizing the outlet temperature of the transfer fluid are included. The results of the analysis are presented as functions of dimensionless parameters. These are applicable to both concentrating and non-concentrating collection systems.

(NUMERICAL CALCULATIONS, THERMAL-POWER)

ST77 13075 THERMODYNAMIC ANALYSIS OF ALTERNATE ENERGY CARRIERS, HYDROGEN AND CHEMICAL HEAT PIPES

Cox, K.E., Carty, R.H., (Kentucky Univ., Lexington, KY), Conger, W.L., Soliman, M.A., Funk, J.E., (New Mexico Univ., Albuquerque, NM), In Miami Univ. 1st World Hydrogen Energy Conf. Proc., Sponsored in part by NASA, V 2:15, See N77-21591 12-44, N77-21608
Avail:NTIS
Hydrogen and chemical heat pipes were proposed as methods of transporting energy from a primary energy source (nuclear, solar) to the user. In the chemical heat pipe system, primary energy is transformed into the energy of a reversible chemical reaction; the chemical species are then transmitted or stored until the energy is required. Analysis of thermochemical hydrogen schemes and chemical heat pipe systems on a second law efficiency or available work basis show that hydrogen is superior especially if the end use of the chemical heat pipe is electrical power.

(THERMODYNAMIC-EFFICIENCY, STORAGE, ENERGY-TECHNOLOGY, HYDROGEN-SCHEMES)

ST77 13076 CONCEPTUAL HELIOSTAT FIELD DESIGN FOR THE ERDA 5 MEGAWATT SOLAR THERMAL TEST FACILITY AT SANDIA ALBUQUERQUE

Curtner, K.L., Fourakis, E.M., Mitchell, P.D., (Honeywell Inc, Energy Resour Cent, Minneapolis, MN), Model Simul Proc Annu Pittsburgh Conf, for 7th Meet, Univ of Pittsburgh, PA, Apr 26-27, 1976, V 7:636-640, pt 1, 1976

The working heliostat field for the ERDA 5 Megawatt Solar Thermal Test Facility was designed to meet the solar thermal power requirements for testing 4 different receiver subsystem research experiment. A ray-trace simulation model of the subsystem research experiment receivers and heliostat field was the principal tool used in this conceptual design. Field deployment, focusing strategy, number of heliostats, and total mirror area required to accomplish the test objectives of the facility were established.

(COMPUTER MODELING)

ST77 13077 ASSESSMENT OF THE SOCIO-ECONOMIC AND ENVIRONMENTAL ASPECTS OF THE CENTRAL RECEIVER POWER PLANTS

Davidson, M., Grether, D., Horowitz, M., (California Univ., Berkeley, CA), 8 p., Aug 1976, CONF-760842-8, LBL-5291

There are several aspects of the central receiver concept of an environmental or ecological nature which are discussed. A severe, direct environmental implication of this technology appears to be destruction of the local ecosystem at and near plant sites. Another significant problem is the water necessary for plant cooling and construction in arid locales. The power plants could modify local and regional climate, but this subject is complicated by many factors and no credible model has as yet been developed to analyze it. Material requirements for these plants, at a level of construction of 8 gWe per year, would appear to have only minor effects on the economy.

(THERMAL-POWER)

ST77 13078 SOLAR-THERMAL POWER SYSTEMS

Denton, J.C., (American Technological University, Killeen, TX), In Alternative Energy Sources, New York, Academic, Press, Inc., Hemisphere Publishing Corp., Washington, DC, p. 219-243, 1976, A77-31467 13-44, A77-31474

The characteristics of the solar energy source are examined, taking into account the solar-energy spectrum at sea level and outside the atmosphere, diurnal and seasonal variations, and direct and indirect radiation. The energy contained in the solar flux can be collected if it is allowed to fall on a suitable collector. A description is presented of focusing and nonfocusing thermal collectors. Approaches for storing the thermal energy from the collectors are discussed, giving attention to thermal-energy storage and chemical energy storage. Electric power utility considerations are also explored.

(ENERGY-TECHNOLOGY, STORAGE, DIURNAL-SEASONAL VARIATIONS, ELECTRIC UTILITY)

ST77 13079 A SOLAR GENERATOR - FOR COLD-STEAM TURBINE OPERATIONS

Dreyer, J., Gehrke, H., Dornier-Post, p. 15-16, N1, 1977, A77-32403, In German

A short-term and intermediate-term solution concerning the decentralized supply of the population in developing countries with electric power can be provided by an approach based on the utilization of regenerative energy sources such as wind or solar energy. A description is presented of a project of West German companies related to the development of a 10-kW solar generator which utilizes for the operation of a turbine, low-temperature heat in the range from 90 to 140°C obtained directly from a solar energy collector or from a thermal storage tank.

(ENERGY-TECHNOLOGY, ELECTRIC-POWER, STORAGE, THERMODYNAMIC-CYCLES, DECENTRALIZED, DEVELOPING-COUNTRIES, WIND, THERMAL-POWER)

ST77 13080 INFRARED TELEVISION MEASUREMENT OF HELIOSTAT IMAGES

Gray, D., (Martin Marietta Aerospace, Denver, CO), Society of Photo-Optical Instrumentation Engineers, Palos Verdes Estates, CA, p. 95-101, 1977, In Optics in Solar Energy Utilization II; Proceedings of the Seminar, San Diego, CA, Aug 24-25, 1976, A77-29576 12-44, A77-29590

The current development of large focusing heliostats to concentrate solar energy on a boiler or central receiver requires a method for measuring the overall efficiency/performance of the heliostat. A flat-plate calorimeter, using the temperature rise in water at a measured flow rate, has been used to test a 22.3-square meter heliostat focused at a distance of 31 meters. This paper presents one of the methods used to accomplish verification of the accuracy of the collected calorimeter data. The method involves the use of a thermovision for determination of temperature gradients and flux patterns on the water-filled plates of the calorimeter both with and without solar-beam impingement. The initial thermovision testing has established that the infrared television can be a potentially valuable tool in the assessment of flux patterns, measurement of losses within the central receivers, and eventually for determination of energy concentrations within a reflected solar beam.

(CALORIMETERS, ENERGY-TECHNOLOGY, FLUX-PATTERNS)

ST77 13081 A THERMODYNAMIC ANALYSIS OF HYCSOS, A HYDROGEN CONVERSION AND STORAGE SYSTEM

Gruen, D.M., Schreiner, F., Sheft, I., (Argonne National Lab., IL), V 2:15, In Miami Univ. 1st World Hydrogen Energy Conf. Proc., See N77-21591 12-44, N77-21622
Avail:NTIS

A two metal hydride system for the storage, retrieval, and conversion of thermal energy is described. The system functions heating, cooling, and power production are discussed for solar energy applications. A thermodynamic analysis particularly of the conversion cycle is presented. It is concluded that solar concentrators providing heat transfer fluid temperatures of 140° could give conversion efficiencies of 16.5 percent.

(EFFICIENCY, METAL-HYDRIDES)

ST77 13082 DESCRIPTION OF THERMAL STORAGE SUB-SYSTEM DESIGNS FOR ERDA'S 10-MWE SOLAR CENTRAL RECEIVER PILOT PLANT

Gutstein, M.U., Kaplan, G.M., (ERDA, Washington, DC), American Society of Mechanical Engineers, Winter Annual Meeting, New York, NY, Dec 5-10, 1976, ERDA-Sponsored Research, ASME Paper 76-WA/HT-68, 9 p., 1976, A77-26491, Members $1.50, Nonmembers $3.00

ERDA's division of solar energy is sponsoring preliminary designs of a 10-mWe solar central receiver pilot plant. Incorporated in each plant design is a storage sub-system that will permit extended operation of the pilot for 6 hr at an output level of 7 mWe. This paper reviews the current design of the thermal storage sub-systems and their integration with the pilot plant. The designs of the experimental models of these sub-systems, to be built and tested prior to final design of the pilot plant, are likewise described.

(THERMOELECTRIC-POWER, ENERGY-TECHNOLOGY, EXPERIMENTAL-DESIGN)

ST77 13083 CENTRAL RECEIVER SOLAR THERMAL SYSTEM, PHASE 1, CPRL ITEM 10 QUARTERLY PROGRESS REPORT

Hallet, R.W., Jr., Garvais, R.L., (McDonnell-Douglas Astronautics Co., Huntington Beach, CA), 83 p., SAN-1108-76-2, MDC-G6382, QTPR-2, E(04-3)-1108, N77-20591
Avail:NTIS

The dominant activities during the reporting period have involved the detailed definition of the subsystem research experiments and the design of the test articles and test facilities. Summaries of these activities are presented. Design changes to the 10-mWe pilot plant preliminary design baseline which occurred during the report period are also described.

(SYSTEMS-ENGINEERING, DESIGN BASELINE, THERMAL-POWER)

ST77 13084 COST OPTIMAL DEPLOYMENT OF MIRRORS ASSOCIATED WITH A HIGH TEMPERATURE SOLAR ENERGY SYSTEM

Hankins, J.D., (Sandia Laboratories, Livermore, CA), Solar Energy, V19:73-78, N1, 1977

Mirror field optimization is discussed in terms of mirror arrays, optimization method, and effect of mirror reflectivity for an absorbing cavity or collector of solar energy mounted on a tower assumed to be erected over horizontal terrain. Many relatively small mirrors of a given size are located about the tower base and the bases of the mirror mounts are rigidly attached to the ground. Each mirror during daylight hours is continuously positioned so that the specular component of incident sunlight is reflected into a aperture located in the cavity base. Results are combined with a simple cost model to obtain a lower bound on the minimum cost per unit of redirected energy as a function of the unit mirror cost.

(MOUNTING, FIELD-OPTIMIZATION, HELIOSTATS)

ST77 13085 ENERGY STORAGE SYSTEM

Herberg, G.M., U.S. Patent 3,996,741, Dec 14, 1976, EDB-77:061316

A system and apparatus for the storage of energy generated by natural elements are described. Energy from natural elements such as from the sun, wind, tide, waves and the like, is converted into potential energy in the form of air under pressure which is stored in a large, subterranean cell. Machines of known types such as windmills are driven by natural elements to operate air compressors. Air compressors pump the air under pressure to the storage cell. Air entering the storage cell displaces water from the cell which returns to a water reservoir as an ocean or a lake. Water locks the air in the storage cell. The stored compressed air is available upon demand to perform a work function as driving an air turbine to operate an electric generator.

(PATENT, COMPRESSED AIR, TIDAL-POWER, WAVE-POWER, WIND)

ST77 13086 SOLAR ENERGY SYSTEMS FOR ELECTRICITY PRODUCTION

Herwig, L.O., (ERDA, Washington, DC), 1976, Pergamon Press, Inc., Elmsford, NY, Energy and The Environment Cost-Benefit Analysis, Karam, R.A., Ed., EDB-77:061489

The paper describes approaches and systems that are under intensive study to convert solar energy resources into electricity. The contents are based upon the results of many research and technology projects supported by the Energy Research and Development Administration to broaden

the technology base for large-scale terrestrial applications and to prove the economic viability of specific solar energy systems. Though the solar electrical systems under study have been demonstrated to some extent in the past, the renewal of interests and efforts toward establishing practical systems arises for many reasons. Among these reasons are: growing recognition of shortages and depletions of fossil fuels, increasing support of energy research by the federal government to develop alternative energy sources and innovative approaches to systems, subsystems and materials.

(ECONOMIC, GOVERNMENT POLICIES, TECHNOLOGY-ASSESSMENT, THERMAL-POWER)

ST77 13087 SOLAR TOWER CHARACTERISTICS

Hildebrandt, A.F., Vant-Hull, L.L., (Houston, University, Houston, TX), In World Hydrogen Energy Conference, 1st, Miami Beach, FL, Mar 1-3, 1976, Proceedings, University of Miami, Coral Gables, FL, Pergamon Press, New York, NY, NSF GI-39456, V 1:3A-3-3A-13, 1976, N77-21562, A77-33326 14-44, A77-33333

The paper reviews the designs of the 100 MWE commercial solar towers and the 10 MWE pilot plants involving a steam-electric cycle. Geometric can material considerations are discussed and best design solutions found up to now are described. The basic characteristics of several thermo-chemical cycles of interest are mentioned.

(THERMODYNAMIC-CYCLES, MATERIAL-CONSIDERATIONS, STORAGE)

ST77 13088 ENERGY STORAGE AND RENEWABLE ENERGY SOURCES

Hitchcock, H.C., Canterbury Eng. J., V4:80-85, May 1975, New Zealand, EDB-77:043206

The position of energy storage related to the electrical industry in New Zealand in connection with self-replenishing energy sources is examined. The systems include hydroelectric, solar, and wind power. The availability of the sources in relation to power demand from season to season is discussed.

(ELECTRIC-POWER, NEW-ZEALAND, WIND, THERMAL-POWER)

ST77 13089 ORGANIC RANKINE CYCLE ENGINE DEVELOPMENT AND SOLAR ENERGY UTILIZATION

Ichikawa, S., Watanabe, M., (IHI, Tokyo, Japan), Heliotech and Dev, Proc of the Int Conf, Dhahran, Saudi Arabia, Nov 2-6, 1975, Publ by Dev Anal Assoc, Cambridge, MA, V 1:739-752, 1976

The Solar-Heat Actuated Organic Rankine-Cycle Engine is one of the most advantageous means of utilizing solar heat, because it is compact and reliable. A 490 kW packaged unit, recently commercialized, and a standardized series of 25 kW and 50 kW packaged units could be applied to a large variety of power requirements, such as electrical generation, water pumping, air-conditioning and refrigeration.

(PACKAGED-UNITS, HEAT-ENGINES)

ST77 13090 SOLAR-HEATED-AIR RECEIVERS---OF SOLAR/GAS TURBINE ELECTRICAL GENERATION PLANT DESIGN

Jarvinen, P.O., (MIT, Lexington, MA), Solar Energy, V19:139-147, N2, 1977, International Solar Energy Society, International Solar Energy Congress and Exposition, Los Angeles, CA, July 28-Aug 1, 1975, Research supported by MIT and U.S. Air Force, A77-30312

Receiver design alternatives for a central tower, heat-air receiver of a solar/gas turbine electrical generation plant are considered. Apertured and unapertured, domed-surface and -cavity receivers are examined and losses such as incident flux reflection and reradiation from the receiver are included. The receiver, constructed of ceramic domes that are individually cooled by impingement-jet heat-transfer techniques, is designed to supply heated air at 1800 F and operate in a pressurized condition at a pressure ratio of four. It is shown that high thermal conversion efficiencies (80-90%) may be achieved with cavity receivers where the interior cavity surfaces are formed from single or multiple domes. The efficiencies of surface receiver elements are found to be substantially less than those of cavities, from 54 to 70 percent. The difference lies in the higher reradiation flux losses of surface receivers.

(THERMODYNAMIC-EFFICIENCY, RECEIVER-DESIGN, CENTRAL-TOWER, ENERGY-TECHNOLOGY, CERAMIC DOMES)

ST77 13091 DESIGN AND COSTS OF HIGH TEMPERATURE THERMAL STORAGE DEVICES USING SALTS OR ALLOYS

Kauffman, K.W., Lorsch, H.G., (Franklin Institute, Research Laboratories, Philadelphia, PA), American Society of Mechanical Engineers, Winter Annual Meeting, New York, NY, Dec 5-10, 1976, ASME Paper 76-WA/HT-34, 11 p., A77-26481
Members, $1.50; Nonmembers, $3.00

Salts and alloys are investigated for application to phase change thermal energy storage for conventional and solar thermal power generation. The total storage cost using alloys is insensitive to the heat exchanger cost per unit area and relatively insensitive to changes in discharge time and temperature between charging and discharging. For the salts, total cost is very dependent on those same parameters. Alloys are substantially lower in cost for charge or discharge times of 12 hr or less. The effect of volume change of fusion on total cost is

determined. Costs may be increased up to 37 percent for salts, 2.5 percent for alloys. Also discussed are the use of metal foam fillers with salts, corrosion, cost of preparation, and the use of heat pipes and mechanical devices.

(CORROSION, HEAT-PIPES, PHASE-CHANGE, THERMAL-POWER, ECONOMICS)

ST77 13092 EFFECT OF SOLAR-RADIATION DENSITY AND ANGULAR SIZE OF RADIATION SOURCE ON EFFICIENCY OF SOLAR POWER PLANTS

Krasina, E.A., Nevezhin, O.A., Rubanovich, I.M., Appl. Solar Energy (USSR) (Engl. Transl.), V12:13-17, N3, 1976, EDB-77:060540

The example of a solar thermoemission power plant is used for the analysis of certain features of solar-power-plant operating regimes for various radiation densities and angular sizes of the radiation source. The calculations are performed both on the assumption of exact pointing of the collector optical axis at the radiation source and with allowance for error. Results are reported for plant-efficiency optimization calculations, together with data on the permissible error angles of the solar tracking system.

(TRACKING, THERMAL-POWER)

ST77 13093 SOLAR ENGINE

Lapeyre, J.M., U.S. Patent 3,984,985, Oct 12, 1976, EDB-77:041560

A solar engine is described including a vessel disposed for motion along a predetermined path and having an array of discrete expandable and contractable chambers disposed in spaced relation along the path. The vessel contains relatively non-expandable fluid while the chambers each contain a relatively expandable and contractable fluid which is of lesser density that the non-expandable fluid. The chambers along a predetermined section of said vessel are maintained at a cooler temperature than those chambers exposed to solar energy. The chambers exposed to solar energy are caused to expand upon heating of the fluid therein, causing displacement of the non-expandable fluid. At the same time, the cooled chambers are caused to contract in response to cooling of the fluid therein and permitting the inflow of an additional quantity of nonexpandable fluid into the cooled section of the vessel. As a result, the cooled section of the vessel contains a greater amount of non-expandable fluid, producing a mechanical unbalance which in turn produces movement of the vessel along the path.

(PATENT, DESIGN, HEAT-ENGINES, THERMODYNAMICS)

ST77 13094 FOUR DIFFERENT VIEWS OF THE HELIOSTAT FLUX DENSITY INTEGRAL

Lipps, F.W., (Univ of Houston, TX), Sol Energy, V18:555-561, N6, 7 refs., 1976

The image due to a single heliostat is represented by its flux density, which can be formulated as an integral over the solid angle of the incoming rays. The incoming ray formulation leads to analytic results for flat heliostats with polygonal boundaries. The mirror plane formulation leads to a numerical integration over the mirror plane which can be used to study effects due to distortions of the mirror. The pin-hole view leads to an approximate expression for the flux density integral as a convolution of the image due to a point Sun with respect to the brightness distribution of the real Sun.

(MATHEMATICAL TECHNIQUES)

ST77 13095 SOLAR OPERATED THERMODYNAMIC DRIVE

McFarland, L.C., U.S. Patent 3,983,704, Oct 5, 1976, ERA-02:022039, EDB-77:041559

A liquid-tight fluid container forming a primary chamber is provided with a vertical standpipe communicating, at its depending end, with the bottom area of the primary chamber and communicating with an elevated tank and chamber, at its upper end, in vertically spaced relation above the primary chamber. The elevated tank is formed in a fluid reservoir in turn communicating with the depending end portion of the primary chamber through a check valve. Solar rays heat fluid which circulates through a heat exchanger disposed in the primary chamber to expand a volatile liquid therein and force it through the standpipe into the elevated tank. The liquid is returned to the reservoir bottom. The liquid drives a hydraulic motor by its movement to or from the elevated tank or both.

(PATENT, FLUID-FLOW, HEAT-EXCHANGERS, HEAT-ENGINES)

ST77 13096 MODELING ASPECTS OF A GAS TURBINE SOLAR-ELECTRIC POWER SYSTEM

McBride, Z.J., Mitchell, P.D., (Black & Veatch Consult Eng, Kansas City, MO), Model Simul Proc Annu Pittsburgh Conf, V7:641-645, 3 refs., 1 pt., Apr 26-27, 1976, for 7th Meet, Univ of Pittsburgh, PA

The models are (1) A Solar Central Receiver Model. This model analyzes the performance of various combinations of collector field and central receiver geometries in terms of gross power received and power flux maps on the receiver walls. The software is a Monte Carlo race-trace. (2) Heat Exchanger and Cavity Analysis. This model evaluates the microscopic performance of the heat transfer surfaces and uses the results to evaluate the macroscopic performance of the receiver cavity as a whole.

(MATHEMATICAL MODELS, COMPUTER SIMULATION, THERMAL-POWER)

ST77 13097 DEVELOPMENT OF THE SOLAR POWER CENTRAL RECEIVER CONCEPT

Murphy, L.M., Skinrood, A.C., (Sandia Labs., Livermore, CA), 26 p., SAND-76-8677 E(29-1)-789, N77-22624
Avail:NTIS
The role and use of the Sandia Solar Thermal Test Facility, is described. Furthermore, details of particular subsystem components, as well as potentially fruitful research areas for Sandia and other development laboratories to pursue which can lead to performance improvements, are discussed.

(TEST-FACILITIES, PERFORMANCE TESTS, THERMAL-POWER)

ST77 13098 SERVO POSITIONING POWER TOWER COLLECTORS FOR SOLAR HEAT CONVERSION TO ELECTRICITY

Parker, R.S., (Honeywell, Inc., Aerospace Div., St. Petersburg, FL), In Conference on Decision and Control and Symposium on Adaptive Processes, 15th, Clearwater, FL, Dec 1-3, 1976, Proceedings, New York, Institute of Electrical and Electronics Engineers, Inc., p. 84-89, 1976, A77-28801 12-63, A77-28811
An overview of Honeywell's power tower concept for conversion of solar generated heat to electricity is presented. The solar collector subsystem control problem is defined. Operating modes including normal tracking, offset pointing, periodic calibration, stowage, and initialization are explained. Mathematics of sun vector computation and atmospheric refraction compensation are discussed. The process of attitude command generation and communication to the individual heliostats is outlined. Features of the control concept which contribute to cost effectiveness are highlighted throughout.

(ENERGY-TECHNOLOGY, MINICOMPUTERS, CONTROL-SYSTEMS, OVERVIEW)

ST77 13099 OPERATIONAL CHEMICAL STORAGE CYCLES FOR UTILIZATION OF SOLAR ENERGY TO PRODUCE HEAT OR ELECTRIC POWER

Prengle, H.W., Jr., Sun, C-H., (Univ of Houston, TX), Sol Energy, V18:561-567, N6, 13 refs, 1976
This paper presents engineering criteria for selection of suitable chemical reactions, and considers in detail two systems: methanol cycle and ammonium hydrogen sulfate (AHS) cycle. The latter appears attractive as an operational cycle, has liquid storage on both sides of the cycle, essentially meets all criteria and has high ΔH (reaction), heat and work efficiencies. Preliminary reactor configurations for the AHS cycle are discussed.

(THERMAL-POWER)

ST77 13100 SOLAR FLUX DENSITY DISTRIBUTIONS ON CENTRAL TOWER RECEIVERS

Riaz, M., Gurr, T., (Minnesota, University, Minneapolis, MN), Solar Energy, V 19:185-194, N2, 1977, E(11-1)-2699, A77-30318
An analytical approach is developed for the determination of the solar flux density distributions produced by a field of individually steered sun-following mirrors on the surface of the central receiver. The mirror field is essentially an approximation to the Fresnel equivalent of a parabolic mirror. Aspects of geometrical configuration are considered along with the dispersion factor, the mirror utilization factor, the insolation degrading factor, and the formulas for flux density calculations. The flux density distributions on vertical cylindrical receivers are investigated.

(ENERGY-TECHNOLOGY, PARABOLOID MIRRORS, RAY-TRACING, FLUX-DENSITY, MONTE-CARLO-METHOD)

ST77 13101 SOLAR TOTAL ENERGY SYSTEMS INDUSTRIAL APPLICATIONS

Rogan, J.E., (ERDA, Washington, DC), (Maryland Univ., College Park, MD), (McDonnell Douglas Astronautics Co., Huntington Beach, CA), Aug 1976, Proceedings of the Solar Industrial Process Heat Workshop, Cherry, W.R., Auer, W.M., Allen, R.W., Anand, D.K., CONF-760655, EDB-77:035243
Demand information obtained from energy intensive industries in the southwest have been utilized to size solar total energy systems, individual process heat and electrical systems. Distributed and central receiver collection systems were investigated. For the example cited, although the central receiver is more efficient, preliminary costing exercises indicate that a distributed system is more economical.

(PROCEEDINGS, PROCESS-HEAT, WORKSHOP, ECONOMICS, THERMAL-POWER)

ST77 13102 SOLAR GENERATORS - UTILIZATION OF SOLAR ENERGY FOR SUPPLY OF ELECTRIC POWER

Schuemann, H.-W., (Arbeitsgemeinschaft Solarenergie, Tagung Auf Der Deutschen Bauausstellung, Essen, West Germany, Jan 29-Feb 6, 1977), Energiewirtschaftliche Tagesfragen, V27:198-200, Mar 1977, A77-28681, In German
A description is presented of thermal and photovoltaic solar electric generators developed by a german company. The devices include a thermal solar generator with a maximum power of 10 KW which employs water as operational medium. The applications for solar generators of various capacities are discussed. Solar cells, consisting of unconventional silicon material, with an efficiency of 10% are shown.

(ENERGY-TECHNOLOGY, PHOTOVOLTAIC, STORAGE, THERMODYNAMIC-EFFICIENCY, THERMAL-POWER)

ST77 13103 OPTICS IN SOLAR ENERGY UTILIZATION II: PROCEEDINGS OF THE SEMINAR, SAN DIEGO, CA AUGUST 24, 25, 1976

Selvage, C., (Sandia Laboratories, Albuquerque, NM), Society of Photo-Optical Instrumentation Engineers, SPIE Proceedings, V85:182, 1977, Seminar sponsored by the Society of Photo-Optical Instrumentation Engineers, Palos Verdes Estates, CA, For individual items see A77-29577 to A77-29596, A77-29576

Attention is given to the optics of photovoltaics, the optics of selective coatings, solar standards and instrumentation and the optics of solar concentrators. Particular papers that are considered discuss gaas solar cells for very high concentrations, improved black nickel coatings for flat plate solar collectors, infrared television measurement of heliostat images, the development of the solar tower program in the United States, and the principles of the fixed mirror solar concentrator.

(CONFERENCES, ENERGY-TECHNOLOGY, PHOTOVOLTAIC, INSTRUMENTS, CONCENTRATORS, UNITED-STATES)

ST77 13104 CYLINDRICAL MIRROR COLLECTOR FIELD

Smith, R.H., (Solergy, Inc., San Francisco, CA), Heliotech and Dev, Proc of the Int Conf, Dhahran, Saudi Arabia, Nov 2-6, 1975, Publ by Dev Anal Assoc, Cambridge, MA, V 1:388-395, 5 refs, 1976

Improved design for a solar collector uses a cylindrical mirror field and a Solergy receiver to obtain concentration ratios over 40. This system is compared with the solar tower and it is found that it could achieve similar performances with lower cost and higher reliability.

(HELIOSTATS, THERMAL-POWER)

ST77 13105 SOLAR-THERMAL ENERGY SYSTEMS

Sparrow, E.M., Sparrow, R.B., (Minnesota, University, Minneapolis, MN), In Alternative Energy Sources, p. 149-182, 1976, Academic Press, Inc., New York, NY, Hemisphere Publishing Corp., Washington, DC, A77-31467 13-44, A77-31472

The characteristics of insolation which have to be considered in an assessment of the potential for solar energy devices at a geographical location are examined. A thermal analysis of flat-plate collectors is conducted, taking into account a qualitative description, the collector energy gain and fluid temperature rise and the mathematical relations concerning the heat losses. Attention is also given to flat-plate collector performance results, thermal storage and space conditioning systems.

(EFFICIENCY, ENERGY-TECHNOLOGY, STORAGE, THERMAL-POWER)

ST77 13106 CENTRAL RECEIVER SOLAR POWER PLANT IN A HYBRID MODE OF OPERATION

Stickley, R.A., Zoschak, R.J., (Sheldahl, Inc., Northfield, MN), AIAA/AAS (Am Astronaut Soc) Sol Energy for Earth Conf, Pap, Los Angeles, CA, Apr 21-24, 1975, Publ by AIAA, New York, NY, 6 p., 1975, Pap 75-624

This paper explores the feasibility of a solar energy system operating in a hybrid, energy displacement mode with a conventional fossil-fueled power generating station. The selection of thermal input processes and plant steam conditions are discussed, together with receiver design and control considerations and justified investment in plant solar components.

(STEAM, THERMAL POWER)

ST77 13107 TERRESTRIAL SOLAR THERMAL ELECTRIC POWER SYSTEM-DEVELOPMENT OF A MODEL PLANT

Tani, T., Sawata, S., Tanaka, T., Sakuta, K., Horigome, T., (Electrotech Lab, Tokyo, Japan), Proc of the Southeast Conf on Appl of Sol Energy, 2nd, Baton Rouge, LA, Apr 19-22, 1976, Sponsored by ERDA, Oak Ridge, TN, p. 365-374, 4 refs, 1976, CONF-760423
Avail:NTIS, Springfield, VA

This model consists of a parabolic trough, a storage-type heat exchanger with the corundum (Al//2O//3) as the heat storage medium. Compressed air is used as the heat transfer medium. The efficiency of the collector is 10 to 32 percent for various direct normal radiation in Tanashi, Tokyo, Japan.

(STORAGE, JAPAN)

ST77 13108 SOLAR THERMAL POWER GENERATION

Teagan, W.P., Atallah, S., Glaser, P.E., (Arthur D. Little, Inc., Cambridge, MA), Heliotech and Dev, Proc of the Int Conf, Dhahran, Saudi Arabia, Nov 2-6, 1975, Publ by Dev Anal Assoc, Cambridge, MA, V 1:720-738, 2 refs, 1976

The primary components of the system are an advanced flat-plate solar collector array and a Rankine-cycle engine which utilizes an organic fluid. Preliminary estimates for the cost of power generated by the proposed facility lies between 3. 9 and 6.8¢/kWhr. A marked improvement in collection efficiency can be realized by the addition of a simple reflector system which in turn would reduce the cost of power generation by 15-30 percent.

(PRELIMINARY-DESIGN, FEASIBILITY-ANALYSIS, FLAT-PLATE, RANKINE-CYCLE)

ST77 13109 TOWER-TYPE SOLAR ENERGY PLANT: CONFIGURATION AND ENERGY EFFICIENCY OF CONCENTRATOR

Teplyakov, D.I., Aparisi, R.R., Appl. Solar Energy (USSR) (Engl. Transl.), V 12:25-34, N3, 1976, EDB-77:060560

Three configurations of tower-type solar power plants with stationary reflectors are considered from the viewpoint of the effectiveness of mirror-surface utilization and stability of energy output over the day, season and year.

(EFFICIENCY, COMPARISONS, THERMAL-POWER)

ST77 13110 DEVELOPMENT OF SOLAR TOWER PROGRAM IN THE UNITED STATES

Vant-Hull, L.L., (Houston, University, Houston, TX), Society of Photo-Optical Instrumentation Engineers, Palos Verdes Estates, CA, p. 104-110, 1977, In optics in Solar Energy Utilization II; Proceedings of the Seminar, San Diego, CA, Aug 24, 25, 1976, A77-29576 12-44, A77-29591

The history and development of the solar tower is traced from the conceptual stage in 1969, through first federal funding in 1973, to a program to initiate pilot plant construction in 1976. In this pilot plant, it is intended that 3,000 heliostats will reflect sunlight onto a central receiver, in which steam at a temperature of 500 C will be generated to drive a turbogenerator.

(ENERGY-TECHNOLOGY, STORAGE, HELIOSTATS, THERMAL-POWER)

ST77 13111 AN EDUCATED RAY TRACE APPROACH TO SOLAR TOWER OPTICS

Vant-Hull, L.L., (Houston, University, Houston, TX), Society of Photo-Optical Instrumentation Engineers, Palos Verdes Estates, CA, p. 111-120, 1977, In optics in Solar Energy Utilization II; Proceedings of the Seminar, San Diego, CA, Aug 24, 25, 1976, E(04-3)-1108 NSF GI-39456, A77-29576 12-44, A77-29592

We describe an approach to the analysis of the optical system of the solar tower concept, which is designed to provide maximum design information. By inputing all quantities in terms of angles or dimensionless ratios the results remain relatively scale independent. First the power redirected from the heliostat field to the central receiver is computed, then solar images are projected from each heliostat to the central receiver and interception factors are obtained. This information allows up to size the central receiver, to enhance performance by redistributing heliostats in the field, and finally to define the rim angle of the field. The procedure for this step by step definition of the solar tower optical system results in optimal heliostat fields, receiver flux distributions and diurnal power curves.

(ENERGY-TECHNOLOGY, FLUX-DENSITY, ANNUAL-VARIATIONS, COMPUTER-TECHNIQUES, HELIOSTAT FIELD)

ST77 13112 PERFORMANCE OF LOW COST SOLAR REFLECTORS FOR TRANSFERRING SUNLIGHT TO A DISTANT COLLECTOR

Zentner, R.C., (Boeing Aerospace Co., Seattle, WA), Solar Energy, V19:15-21, N1, 1977, International Solar Energy Society, International Solar Energy Congress and Exposition, Los Angeles, CA, July 28-Aug 1, 1975, A77-25896

Steerable reflectors (heliostats) in a typical central collector solar-electric power plant are intended to transfer ambient sunlight to a central heat absorber. One property critically important in the assessment and selection of candidate plastic film reflectors is their specularity. The paper focuses on describing the instrument and test procedure used to measure the quasi-specularity of candidate reflector materials such as Kapton-H, Tedlar and standard Mylar. Specularity of the sample is determined by illuminating it with a sharply defined incident beam and measuring the reflected energy which is collected by a series of circular concentric openings of increasing size. These discrete points, generalized to a curve, describe the spatial distribution of energy in the reflected beam. Comparison of this distribution with the spatial distribution of incident flux characterizes the sample specularity. All sample data are measured using linear polarized output of a helium-neon gas laser.

(DIRECTIONAL-CONTROL, HELIOSTATS, PLASTIC-FILM REFLECTORS)

ST77 13113 CALCULATION OF OPTICAL CHARACTERISTICS OF RADIANT ENERGY RECEIVERS IN HIGH TEMPERATURE INVESTIGATIONS

Zakhodov, R.A., Illinskii, A.I., (Acad of Sci of the Uzb SSR), Geliotekhnika, p. 38-42, N6, 11 refs., 1976, In Russian

A theoretical investigation of the effect of the imbalance of the "radiation-receiver" system on the integral optical characteristics of a receiver is carried out. The values of the integral coefficient of absorption and of the integral radiation capacity of tungsten and molybdenum within a wide range of changes in the temperature of the receiver and radiator are calculated. Invalidity of Kirchhof's integral law for unbalanced selective systems is shown.

(HELIOSTATS)

14,000 THERMIONIC/THERMOELECTRIC

ST77 14008 CONVERTING FLUCTUATION ENERGY OF HEATED ELECTRONS TO DC POWER

Boogaard, T., Natl., Eng, V 80:8-10, N8, Aug 1976, Patent, EDB-77:049874
The purpose of the invention described is to efficiently convert fluctuation voltage resulting from heated electron motion to a useful source of output power. Large potential power output exists because a fundamental aspect of fluctuation energy is that it is independent of the size and of electrons in the component.

(PATENT, THERMAL-POWER, THERMIONIC)

ST77 14009 INVESTIGATION OF THE GROWTH OF DIRECTIONALLY SOLIDIFIED EUTECTICS WITH POTENTIAL AS ELECTRON EMITTERS - FINAL REPORT APR 1, 1975-SEPT 3, 1976

Chapman, A.T., Cochran, J.K., (Georgia Inst. of Tech., Atlanta, GA), NASA-CR-149859, 76 p., School of Ceramic Engineering, NAS7-100, JPL-954193, E-18-610, N77-19317
Avail:NTIS
The construction of a solar furnace was completed and it was tested after a preliminary alignment of the heliostat mirrors. After final alignment, the solar furnace is used for directional solidification experiments designed to simulate space conditions.

(FURNACES, HELIOSTAT, THERMIONIC)

ST77 14010 ENERGY-DIRECT-CONVERSION IN SOLAR TECHNOLOGY

Justi, E.W., (Braunschweig, Technische Universitaet, Braunschweig, West Germany), Deutsche Gesellschaft Fuer Sonnenenergie, Tagung Ueber Grundlagen Der Solartechnik I, 2nd, Stuttgart, West Germany, 14 p., Oct 22, 1976, Paper, A77-29574, In German
The possibilities which exist concerning the conversion of energy from one form into another are illustrated with the aid of a matrix, which takes into account mechanical, thermal, electrical, chemical, and light energy. The direct conversion of solar heat into electrical energy by means of the thermoelectric Seebeck Effect is considered. It is pointed out that low-energy conversion efficiencies in the case of conventional thermocouples have been increased by the factor 100 in connection with studies conducted by Joffe and Associates in the Soviet Union and by Justi and Associates in West Germany. Attention is given to the use of thermoelectric materials of the type Bi2Te3 and their optimization, the intermetallic alloy 51In49Sn, a hot water/cold water thermogenerator with an efficiency of 4%, Pb-Te materials, Ge-Si alloys, and a solar collector equipped with thermocouples.

(ENERGY-TECHNOLOGY, THERMOELECTRIC MATERIALS, SEEBECK-EFFECT)

15,000 OCEAN THERMAL DIFFERENTIAL

ST77 15036 SOLAR ENERGY FROM THE OCEAN

Arch. Energiewirtsch., V 30:999-1000, N11, Nov 1976, EDB-77:060562, In German
In the latest edition of the journal 'Energy International' great hopes are put in the generation of electrical energy from thermal gradients discovered in the tropical oceans. As a result of the 5 reports recently published by teams of scientists in the USA, the author Dr. David F. Mayer (University New Orleans) considers the plan to generate energy on a large scale justifiable from the economic point of view.

(ECONOMICS, OCEAN-ΔT)

ST77 15037 SOLAR ENERGY. OCEAN/THERMAL: AN UNMIXED BLESSING

Mosaic, V 5:22-23, N2, Spring 1974, EDB-77:047347
The possibility of operating power plants on the temperature differences between warm surface water and frigid deep water is explored.

(FEASIBILITY-STUDIES, OCEAN-ΔT)

ST77 15038 DESIGN OF COLD WATER PIPE FOR SEA THERMAL POWER PLANTS. PROGRESS REPORT, 1 MAY 1975-30 MAY 1976

Anderson, J.H., Sea Solar Power, Inc., York, PA, June 1976, COO-2691-2, EDB-77:053818
Avail:NTIS HC$4.50

This report covers the preliminary analysis of design conditions for a 40-ft. diameter, 4000 ft. long, cold water supply pipe for a 100 mW sea thermal power plant. The pipe is assumed to be freely suspended from a floating platform. The design is based on a circular row of tubes with spacers between to form the pipe wall. Internal pressure conditions are calculated for maximum assumed flow rates in the pipe. External pressure distribution is calculated for maximum assumed ocean current velocity. Drag and moment distributions are calculated for the pipe loaded with an assumed current velocity profile and buoyancy distribution. Collapse stability calculations are made for the pipe and for the individual tubes. Tube and spacer interaction stresses are calculated for the combined pressure, bending moment, and tensile loads imposed on the pipe. Preliminary analysis is performed on a flexible pipe support system capable of isolating the pipe from the platform during any sea state likely to be encountered by a sea thermal power plant. It is concluded that the basic design is feasible and justifies more precise analysis.

(OCEAN-ΔT)

ST77 15039 EQUIPMENT FOR ENERGY GENERATION USING THE TEMPERATURE GRADIENTS BETWEEN DIFFERENT LAYERS OF THE OCEAN

Anderson, J.H., Anderson, J.H., Jr., Patent, Jan 29, 1976, German, FRG, Patent 1,476,676/C//, EDB-77:041501, In German

An equipment to generate energy by making use of the temperature gradient between different layers of the sea is described. The energy necessary to evaporate the operating material is drawn from the sea water. Evaporator and condenser are arranged at a water depth at which the water pressure corresponds to the vapour pressure of the operating material at the hot or cold water temperature. The flow channels of the evaporator and the condenser run separately and are connected to turbines which serve as energy generator. The following materials serve as operating material: propylene, dichloro-difluoro-methane, monochloro-difluoro-methane, monobromo-trifluoro-methane, monochloro-trifluoro-methane-butane, isobutane, propane.

(PATENT, EVAPORATORS, HEAT-EXCHANGERS, WORKING FLUIDS, OCEAN-ΔT)

ST77 15040 SYSTEMS ASPECTS OF OCEAN THERMAL ENERGY CONVERSION

Douglass, R.H., Jr., Bakstad, P., (TRW Syst Group, Redondo Beach, CA), AIAA/AAS Sol Energy for Earth Conf, Pap, Los Angeles, CA, Apr 21-24, 1975, Publ by AIAA, New York, NY, 4 p., 1975, Pap 75-615

A team led by TRW Systems Group has synthesized a baseline design for an OTEC plant of 100 mWe output, with initial cost of $2100/kW, a cost which could be reduced considerably through the application of new technology and proposed refinements in baseline subsystems. It is estimated that a per-kilowatt cost of $1100 for a functioning OTEC plant could be realized before 1990 if a vigorous research and development program is carried out.

(HEAT-ENGINES, OCEAN-ΔT, ECONOMICS)

ST77 15041 WORKSHOP ON OCEAN THERMAL ENERGY CONVERSION (OTEC), 3RD, PROCEEDINGS, 1975

Dugger, G.L., ed., (Johns Hopkins Univ, Appl Phys Lab, Laurel, MD), Workshop on Ocean Therm Energy Convers (OTEC), 3rd, Proc, Spec Rep, Houston, TX, May 8-10, 1975, Publ by Johns Hopkins Univ., Appl Phys Lab, Laurel, MD, p. 232, 1975, APL/JHU SR 75-2
Avail:NTIS, Springfield, VA

Thirty three papers by various authors are presented. The topics discussed are all aspects of ocean thermal energy conversion including: engineering evaluation studies; solar sea power plants, costs and economics; open cycle plants; evaluations of platform designs; mooring cable studies; feasibility studies of submerged concrete structures for OTEC power plants; electrical energy transmission lines; working fluids; heat exchanger design; and environmental impact and oceanographic studies.

(ENGINEERING-EVALUATION, ECONOMICS, PLATFORM-DESIGNS, MOORING, WORKING-FLUIDS, ENVIRONMENTAL-IMPACT, OCEAN-ΔT)

ST77 15042 SOLAR POWER FROM THE OCEANS - OCEAN THERMAL ENERGY CONVERSION

Haber, G., New Scientist, V 73:576-578, Mar 10, 1977, A77-26724

A description is presented of the basic features of the ocean thermal energy conversion (OTEC) scheme. The scheme is to utilize the temperature differences between the warm waters of ocean surfaces and the cool waters found at a greater depth. In one OTEC project a cold-water intake pipe would extend down into the ocean approximately 4000 ft and would bring up cold water. In the upper layers of the ocean, the temperature difference between surrounding surface water and the water in the pipe would be about 20°C. A working fluid, distinct from sea water, is to be vaporized and then converted into its original liquid form for reuse in a closed-cycle or Rankine-cycle system. One of the major problems concerning an implementation of OTEC appears to be related to the design of a reasonably priced heat exchanger which will have an adequate operational life under the given environmental conditions.

(ENERGY-TECHNOLOGY, ECONOMICS, RANKINE-CYCLE, HEAT-EXCHANGER, OCEAN-ΔT)

ST77 15043 OCEAN THERMAL GRADIENTS: A PRACTICAL SOURCE OF ENERGY

Henrie, J.O., Science, V 195:206-207, N4274, Jan 14, 1977, EDB-77:035247
Comments are presented on Beck's ocean thermal gradient hydraulic power plant and Zener and Felkovich's foam solar sea power plant. Rebuttals by Beck and Zener and Felkovich are included.

(FOAM, COMPARISONS, OCEAN-ΔT)

ST77 15044 SOLAR SEA POWER PLANTS (CITATIONS FROM THE NTIS DATA BASE)

Hundemann, A.S., (NTIS, Springfield, VA), 95 p., Nov 1976, NTIS/PS-76/0901/9WE
Technical and economic feasibility of solar sea power plants are discussed. Topic areas cover condenser, evaporator, and heat exchanger design; and fouling and corrosion prevention. Included are a few abstracts pertaining to site selection, dynamic modeling studies, and general studies dealing with solar sea power as an energy alternative.

(OCEAN-ΔT)

ST77 15045 SOLAR SEA POWER PLANTS (CITATIONS FROM THE ENGINEERING INDEX DATA BASE)

Hundemann, A.S., (NTIS, Springfield, VA), 69 p., Nov 1976, NTIS/PS-76/0902/7WE
The present status and future prospects of using the ocean thermal gradient for production of electric power are discussed. Engineering, economic, and feasibility studies are covered, including studies dealing with systems and component design.

(OCEAN-ΔT)

ST77 15046 OCEAN THERMAL ENERGY CONVERSION: RESOURCE, ECOLOGICAL AND ENVIRONMENTAL STUDIES

Lewit, H.L., (Ocean Data Systems, Inc., Monterey, CA), NSF/RA/N-74/374, 182 p., Aug 1975, PB-264 242/9WE
Studies to define optimum geographical locations for Ocean Thermal Energy Conversion (OTEC) plant sites were carried out. This report presents the results of the first of six subtasks - thermal structure mapping. Subtask 1 includes an area from the Equator to 60 degrees N, from 60 degrees W to 160 degrees W. The four seasons are represented by data for January, April, July, and October. Nine categories of maps are included.

(THERMAL-STRUCTURE, MAPS, OCEAN-ΔT, SITING)

ST77 15047 AN ASSESSMENT OF THE OCEAN THERMAL ENERGY POTENTIAL OF THE FLORIDA CURRENT

Mangarella, P.A., (Massachusetts Univ., Amherst, MA), NSF/RANN/SE/GI-34979/TR/75/6, NSF/RA/N-75/302, 30 p., June 1975, PB-265 615/5WE
This report assesses the thermal gradient energy resource of the Florida current located at the southeastern seaboard of the United States where the Gulf Stream is diverted northward.

(UNITED-STATES, GULF-STREAM, OCEAN-ΔT)

ST77 15048 OTEC ANNUAL REPORT TO THE DIVISION OF SOLAR ENERGY FOR FY-1976 AND THE TRANSITION QUARTER

Perrigo, L.D., Jensen, G.A., (Battelle Pacific Northwest Labs., Richland, WA), Nov 1976, BNWL-2154, EDB-77:041499
Avail:NTIS HCS4.00
Information on the technical program effort by the biofouling and corrosion project activity office for the reporting period January through September 1976 is presented in three subsections. The first subsection deals with the methodology used to guide the technical efforts of the Project activity office during its period of startup and before a detailed master plan is developed and approved. The second subsection describes the projects developed for funding in FY-1976 and the rationale for their selection. The final subsection presents a summary of significant technical information obtained from various projects.

(CORROSION, FOULING, HEAT-EXCHANGERS, RESEARCH-PROGRAMS, OCEAN-ΔT)

ST77 15049 NUCLEATING VAPORIZATION AND EXTENDED SURFACE HEAT TRANSFER AT LOW TEMPERATURE DIFFERENCE. ANNUAL REPORT

Sabin, C.M., Poppendiek, H.F., Connelly, D.J., Meckel, P.T., (Geoscience Ltd., Solana Beach, CA), 126 p., May 1976, GLR-165
The objectives of this OTEC program are to investigate methods by which nucleate boiling on the outside of tubes in anhydrous ammonia and forced convection for water flow inside tubes can be improved. In the case of the boiling work, both higher heat fluxes and lower wall-saturation temperature differences for boiling inception are sought. In the case of the forced

convection studies, it is desired to find ways of increasing the convection conductances with only small or modest changes in the corresponding friction factors by increasing the fluid velocities in the boundary layer. During this first year's exploratory efforts, the ammonia nucleate boiling conductances have been increased and the wall-saturation temperature differences for boiling inception decreased by surface treatment consisting of sandblasting, electroplating, and screening. Also, significant improvements in forced convection conductances for water flow in tubes containing special vane systems that control boundary layer velocities have been identified; in addition, heat transfer improvements over fluid friction in certain Reynolds modulus regions have been found for special surface roughening.

(FORCED-CONVECTION, HEAT-FLUXES, HEAT-EXCHANGERS, OCEAN-ΔT)

ST77 15050 DIRECT CONTACT OF LOW-BOILING, WATER-IMMISCIBLE MEDIUM WITH HOT AND COLD BODIES OF WATER TO TRANSFER HEAT FOR PURPOSES OF ENERGY PRODUCTION AND/OR DESALINATION

Smith, C.S., Jr., Patent, Oct 19, 1976, US Patent 3,986,938, EDB-77:041502

A low boiling, water immiscible medium is directly contacted in liquid state with relatively hot or warm water (e.g., with hot recycled fresh water in a desalination system or with warm surface sea water in an energy production system) and in vapor state with relatively cold or cool water (e.g., surface sea water in a desalination system or deep sea water in an energy production system) whereby thermal energy is efficiently transferred between the phases that are so contacted/ the energy transfer is for the purpose of evaporating the immiscible liquid in an energy production system and is for the purpose of evaporating saline water in a desalination system/ and the effluent from the process which is returned to its natural environment (e.g., to the sea) is treated to remove all significant amounts of entrained and dissolved immiscible medium.

(PATENT, WORKING-FLUIDS, OCEAN-ΔT)

ST77 15051 OCEAN THERMAL ENERGY CONVERSION PROGRAM. EPFFEP PROGRAM FOR OTEC STRUCTURAL SYSTEMS

Suzuki, H., Chen, W.F., (Lehigh Univ., Bethlehem, PA), 133 p., 1976, COO-2682-8

A constitutive relation and failure criterion for concrete material under general three-dimensional stress states has been developed using the work-hardening theory of plasticity. The formulation has all the required properties of concrete and gives a close estimate to experimental stresses for complete general stress states. In order that the results of research be readily usable in the analysis of suboceanic structures such as the large shells proposed for adoption in the Ocean Thermal Energy Conversion program (OTEC), corresponding computer code called EPFFEP (Elastic Plastic Fracture Finite Element Program) is developed here to reflect this material response. This report describes the details of this program and its implementation on the computer system CDC 6400. It defines all the input and output of the program along with an example illustrating a typical application of EPFFEP modeling. Detail computer algorithm for the constitutive relations of concrete is also given in the form of flow charts.

(CONCRETE, MATERIAL-RESPONSE, OCEAN-ΔT, COMPUTER-MODEL)

ST77 15052 ALTERNATIVE ENERGY TRANSMISSION SYSTEMS FROM OTEC PLANTS. PROJECT 8980 FIRST QUARTER PROGRESS REPORT, JULY-SEPTEMBER 1976

Talib, A., Konopka, A., Biederman, N., (Institute of Gas Technology, Chicago, IL), 38 p., Oct 1976, COO/2426-1

During the first quarter, efforts were concentrated on analyzing the technoeconomic characteristics of synthesis plants for methanol and certain high-energy fuels. This first quarterly report presents an analysis of the production of methanol fuel from the OTEC plant. Process descriptions, process flow charts, material and energy balances, capital cost estimates, and unit cost estimates were developed for methanol production at 100-mW and 300-mW OTEC plant capacities. Two schemes for the production of methanol were considered. In one scheme, a portion of the recycled gas stream, composed of a mixture of hydrogen and carbon dioxide, is taken from the methanol reactor effluent and burned in a boiler as fuel to generate high-pressure superheated steam. The steam is used in steam turbines for feed gas and recycle gas compression. The second scheme is based on the use of electric drivers for feed gas and recycle gas compressors. The production economics of these two schemes were evaluated to determine the advantages and disadvantages of reduced raw materials consumption vs. increased electricity consumption.

(TECHNOECONOMIC, METHANOL, ENERGY-BALANCES, ECONOMICS, OCEAN ΔT)

ST77 15053 OCEAN THERMAL ENERGY CONVERSION SYSTEM EVALUATION

Trimble, L.C., Messinger, B., (Lockheed Missiles & Space Co, Inc, Sunnyvale, CA), AIAA/AAS Sol Energy for Earth Conf, Pap, Los Angeles, CA, Apr 21-24, 1975, Publ by AIAA, New York, NY, 19 p., 1975, Pap 75-616

The paper reports on one aspect of an ocean thermal power plant, heat exchangers and their associated pumps. The study confirmed that not only do the heat exchangers impact the total system technical design, but they may account for up to 75% of the cost of power generation

components and up to 57% of the total system initial cost. The nature of the heat exchanger application is discussed, along with some approaches to design solutions.

(HEAT-EXCHANGERS, DESIGN-SOLUTIONS, OCEAN-ΔT, ECONOMICS)

ST77 15054 SITE LIMITATIONS ON SOLAR SEA POWER PLANTS

Zener, C., (Carnegie Mellon Univ, Pittsburgh, PA), J Hydronaut, V 11:2-3, N1, 1 ref, Jan 1977
In this paper, Q(max) (upper limit upon the warm water intake) is calculated as a function of thickness of the upper mixed layer, the ocean current velocity, and the site latitude. Typically, this upper limit corresponds to a maximum electrical power output of some thousands of megawatts.

(OCEAN-ΔT, WARM-WATER-INTAKE)

ST77 15055 FOAM SOLAR SEA POWERPLANT

Zener, C., Fektovich, J., (Carnegie-Mellon Univ., Pittsburgh, PA), Science, V 189:294-295, N4199, July 25, 1975, EDB-77:047348
A modification of the open-cycle solar sea powerplant concept developed by Beck is presented in which the mixed liquid-vapor phase has a foam structure rather than the structure of a continuous vapor phase interspersed with droplets of liquid, or of a continuous liquid phase interspersed with vapor bubbles. This modification results in a higher efficiency and a low capital cost per unit power output.

(FOAM-STRUCTURE, THERMODYNAMIC-CYCLES, WORKING-FLUIDS, OCEAN-ΔT)

16,000 WIND POWER CONVERSION

ST77 16047 SOLAR ENERGY. WINDPOWER: A NEW LOOK AT AN OLD DRAFT

Mosaic, V 5:20-21, N2, Spring 1974, EDB-77:047488
A brief discussion is presented on the potential of the wind for electric power generation.

(WIND)

ST77 16048 WINDMILLS IN TVIND

Ingenioeren, V 25-26, June 1976, Translation, ERDA-TR--230, EDB-77:047491
Avail:NTIS HC$4.00
Design characteristics and operating parameters of wind turbines built by the Tvind, Denmark Schools are presented.

(OPERATING-PARAMETERS, DENMARK, FABRICATION, WIND)

ST77 16049 A WIND ENERGY SYSTEM UTILIZING HIGH PRESSURE ELECTROLYSIS AS A STORAGE MECHANISM

Allison, H.J., (Oklahoma State University, Stillwater, OK), In World Hydrogen Energy Conference, 1st, Miami Beach, FL, Mar 1-3, 1976, Proceedings, University of Miami, Coral Gables, FL, Pergamon Press, New York, NY, V 2:2B-3-2B-14, 1976, A77-33326 14-44, A77-33376
The paper describes a technique of energy storage which utilizes electrolysis cells to disassociate water into its component gases, and then stores the evolved hydrogen as a high pressure gas, or liquid, or hydride. This system, in conjunction with solar and wind energy generating systems, has been the subject of research since 1961. Present performance parameters for those components of the system which have reached the prototype stage are provided, and remaining problems and economic considerations are discussed.

(ENERGY-TECHNOLOGY, ECONOMICS)

ST77 16050 WIND AS A POWER SOURCE FOR OCEANOGRAPHIC PLATFORMS

Bade, P., (Technische Univ. Berlin, Germany, F.R.), 1976, AED-CONF--76-203-005, US Sales Only, AED-CONF-76-203-005, EDB-77:060889
Avail:NTIS HC$3.50
The energy demand of platforms in ocean engineering can be satisfied by wind energy converting systems. The relatively low and continuous power demand of such stations, and the great average wind velocities in the ocean makes the use of wind energy converters economic. Although there are satisfactory results with new vertical axis wind rotors (Darrieus-Rotor), the wind turbine with horizontal axis of rotation and high tip-speed ratio of the rotor blades seems to be the most effective and economic system. To ensure the power supply of the station

also during longer periods of no wind, the wind converter has to work in connection with storage battery banks. Both parts, wind converter with alternator and the storage batteries, have to be an integrated system.

(ECONOMIC, HORIZONTAL-AXIS, STORAGE)

ST77 16051 WIND TURBINE

Blackwell, B.F., Feltz, L.V., Maydew, R.C., Patent, Apr 8, 1976, German, FRG, Patent 2,540,757/A//, EDB-77:054019, In German

A vertical-axis wind turbine is described. The drive rotor of the turbine has a number of oblong blades, the central bent portions of which are of streamline shape. The particular curved shape of the blades ensures that mainly tensile stress will occur in the blade. The turbine is of the self-starting type. This is attained by starter rotors. Each of these rotors has a number of hollow blades which are arranged in opposite directions, the blades partly overlapping each other in S shape. The speed ratio of the turbine has a value of approx. 5 to 7. In practice, turbine plants may be built which consist of a number of drive rotors arranged one above the other on the shaft. Each following drive rotor has a greater diameter than the adjacent lower rotor.

(PATENT, PERFORMANCE TESTING, BLADES, VERTICAL-AXIS)

ST77 16052 POWER GENERATING APPARATUS

Bright, C., Wind Turbine, Aug 10, 1976, US Patent 3,974,395, EDB-77:060895

A control system for obtaining maximum power output from electrical generating water pumping, flywheel storage and like systems comprising a wind-driven prime mover coupled to an electrical generator over an extended range of wind velocities is described. The maximum electrical output power is obtained by synchronizing the speed of the generator, and hence the speed of the prime mover, with the maximum power output of the prime mover. Since the maximum output power of a wind-driven prime mover is proportional to the third power of the wind velocity, and is a function of an angular velocity-dependent power coefficient, means are provided for detecting the angular velocity of the prime mover and generating a signal proportional to the cube of the wind velocity. The signal thus generated is used for controlling the magnitude of the excitation field current in the electrical generating apparatus whereby the electrical output varies approximately as a cubic function of the wind velocity and, consequently, as a linear function of the output power of the prime mover. For this purpose the control-signal generating means employs a solid state device or the like which is biased to operate along the third power portion of its characteristic operating curve.

(PATENT, CONTROL-SYSTEMS, WIND)

ST77 16053 FEASIBILITY INVESTIGATION OF THE GIROMILL FOR GENERATION OF ELECTRICAL POWER

Brulle, R.V., (McDonnell Aircraft Co., St. Louis, MO), 155 p., 10 refs, Nov 1975, COO-2617-75/1

The cyclogiro computer program, obtained from Prof. H.C. Larsen of the United States Air Force Institute of Technology, was modified to incorporate computation of blade loads for the normal operating and gust loading conditions. The program was also changed to allow computation of the effects of smoothing the blade rock angles in the region where they experienced large oscillations due to passing through a vortex shed by the previous blade. Using this program the various effects of rotor geometric parameters were investigated. Giromill configuration design concepts were explored. A baseline concept was adopted having an upper structural triangular tower extending through the lower support tower and supported by two main rotor bearings. Twenty-one different Giromill systems covering a power range of 120, 500 and 1500 kW were then synthesized. These were structurally analyzed and sized. An automatic electronic control concept built around existing equipment and employing state of the art techniques was developed. Preliminary cost estimates for generating electrical power from the Giromill systems were completed. Cost estimating relationships of the major items of equipment were formulated.

(COMPUTER-PROGRAM, BLADE-LOADS, WIND, ECONOMICS, CONTROL-SYSTEMS)

ST77 16054 BASIC RELATIONSHIPS TO DETERMINE WIND POWER AND SOLAR RADIATION AVAILABLE FROM THE ATMOSPHERE

Carter, E.A., (Univ of Alabama, Huntsville, AL), Proc of the Southeast Conf on Appl of Sol Energy, 2nd, Baton Rouge, LA, Apr 19-22, 1976, Sponsored by ERDA, Oak Ridge, TN, p. 381-389, 1976, CONF-760423
Avail:NTIS

The National Weather Service has many years of records of wind speed and solar radiation from numerous locations throughout the nation. The optimum amount of energy contained in the wind and solar radiation at these locations can easily be calculated from these past weather records. A method is shown to convert the summarized records to power units of watts per square meter. This will provide a measure of the basic sun and wind energy in familiar terms. This information and procedure may be applied to other situations such as variations in location, size and efficiency.

(COMPARISONS)

ST77 16055 TILTING AT WINDMILLS

Collins, G., Simpson, R.J., (Preston Polytech., Eng.), History of Windmills, Electron. Power, V 22:347-351, N6, 11 refs, June 1976; EDB-77:041621

Descriptions of some very early windmills are followed by a history of the design, fabrication, erection and control of windmills for the generation of electricity including the development of the vertical-axis machine.

(HISTORY, FABRICATION, VERTICAL-AXIS)

ST77 16056 EQUIPMENT FOR UTILIZATION OF WIND ENERGY, PARTICULARLY FOR HEATING OF LIQUIDS

Duc, M., Patent, Apr 29, 1976, German, FRG, Patent 2,545,951/A//, EDB-77:054016, In German

A plant for utilizing wind energy, which is particulary used for heating liquids, is described. The wind turbine has either a horizontal or a vertical axis. An electric generator is arranged directly on the axis. The electric energy supplied by the generator is used for heating elements arranged in the supply vessel of the liquid. Depending on the energy amount generated, the liquid of the heating system (e.g. central heating) is heated either proportionally or completely through the wind energy equipment. With calm or low wind, the liquid is heated conventionally by means of a normal heating system.

(PATENT, VERTICAL-AXIS, STORAGE, HORIZONTAL-AXIS)

ST77 16057 DIFFUSER AUGMENTATION OF WIND TURBINES

Foreman, K.M., Gilbert, B., Oman, R.A., (Grumman Aerospace Corp., Bethpage, NY, Research Dept.), 1976, CONF-760842--6, EDB-77:060890
Avail:NTIS HC$3.50

Wind tunnel investigation of models of two diffuser design concepts is directed toward unconventional, very short, cost-effective configurations. One approach uses the energetic external wind to prevent separation of the diffuser's internal boundary later. Another method used high lift airfoil contours for the diffuser wall shape. Diffuser model tests have indicated almost a doubling of wind power extraction capability for dawts compared to conventional turbines. Economic studies of dawts have used these test data and recent (1975) cost projections of wind turbines with diameter. The specific power costs ($/kW) for a realistic dawt configuration are found to be lower than conventional wind turbines for very large size rotors, above 50 meters diameter, and for rotor diameters less than about 20 meters. The cost-to-benefit assessment for intermediate size rotors is affected by the uncertainty band of cost for these rotor sizes.

(AERODYNAMICS, ECONOMICS, PERFORMANCE-TESTING, WIND-TUNNELS)

ST77 16058 SYNCHRONIZATION OF THE ERDA-NASA 100 LKW WIND TURBINE GENERATOR WITH LARGE UTILITY NETWORKS

Hwang, H.H., Gilbert, L.J., (NASA, Lewis), NASA-TM-X-73613, 17 p., July 1977, E-9096, N77-19580/8WE

The synchronizing of a wind turbine generator against an infinite bus under random conditions is studied. With a digital computer, complete solutions for rotor speed, generator power angle, electromagnetic torque, wind turbine torque, wind turbine blade pitch angle, and armature current are obtained and presented by graphs.

ST77 16059 WINDMILLS STAGE A COMEBACK

Jayadev, T.S., (Univ. of Wisconsin, Milawukee, WI), IEEE Spectrum, V 13:45-49, N11, Nov 1976, EDB-77:041623

Various types of wind turbines are described. The power conversion systems, electronics, and cost factors are compared.

(COMPARATIVE-EVALUATIONS, EFFICIENCY, ECONOMICS)

ST77 16060 WINDMILLS CHANGE DIRECTION

Musgrove, P., (Reading Univ., England), New Sci., V 72:596-597, N1030, Dec 9, 1976, EDB-77:054968

Britain needs a national program for research and development of wind power to see if the North Sea's wind can compete with its oil and gas as an energy source. Environmental and land-use pressures will require that large windmills be built in shallow offshore waters where the high wind speeds can compensate for the extra cost. As the southern North Sea gas fields are depleted they will provide natural energy storage reservoirs for compressed air, which can then be used for power on windless days. Wind-generated energy can also be used to electrolyze water and the reservoirs used to store hydrogen. Costs for wind power are primarily interest and repayment for the capital investment since the energy source is free. Current estimates are 150 to 250 pounds per installed kilowatt, with a breakeven point higher than the 130 pounds needed to be economically feasible. When these figures are adjusted for inflation, however, the breakeven point is 200 pounds, the estimated cost for large-windmill systems. As conventional fuels are depleted and become more costly, wind power will be more attractive to

future generations. Improvements in windmill design, particularly the high-speed vertical-axis windmill, will reduce capital costs. This design does not need to be oriented into the wind, and the electrical generator can be placed on ground level. The use of straight blades allows inexpensive construction materials. Small-scale windmills will be useful for farms, remote areas, and in developing countries.

(VERTICAL-AXIS, DEVELOPING-COUNTRIES, ECONOMICS, ENVIRONMENTAL-EFFECTS, GOVERNMENT-POLICIES, RESEARCH-PROGRAMS, UNITED-KINGDOM)

ST77 16061 ECONOMIC EVALUATION OF SMALL-SCALE WIND POWERED ELECTRIC GENERATION SYSTEMS

Obermeier, J.L., Townes, H.W., (Montana State Univ, Bozeman, MT), ASME Pap, 4 p., 13 refs, Dec 5, 1976, for Meet, N76-WA/Ener-1

Presented is an economic evaluation of several commercial wind powered electric generation systems of the type which could be used by an individual home owner. A system included a wind plant, tower, storage battery and d-c to a-c inverter. The analysis considered a total of 12 different system configurations. The evaluation of energy output was based on wind speed data for several locations in the state of Montana. The results of the evaluation indicate that some of the "home built" systems are competitive economically at the present time in some "windy" locations. None of the systems which are economic could individually supply the entire power requirement for a single family dwelling.

(MONTANA)

ST77 16062 EVALUATION OF THE POTENTIAL ENVIRONMENTAL EFFECTS OF WIND ENERGY SYSTEM DEVELOPMENT

Rogers, S.E., Duffy, M.A., Jefferis, J.G., Sticksel, P.R., Tolle, D.A., (Battelle Columbus Labs., OH), NSF/RA-706188, 193 p., Aug 1976, ERDA/NSF/07378-75/1

The first phase of an evaluation of the potential for environmental effects from the development of wind energy was completed. A keyworded bibliography concerning microclimatic alterations by wind and reactions of flora and fauna to altered wind regimes is presented. This literature serves as background material for discussion of potential microclimatic and ecological effects. A baseline climatological and biological survey of the ERDA/NASA 100 kW Experimental Wind Turbine site near Sandusky, Ohio, provides input to a follow-on field program designed to provide quantification of the operational effects of the 100 kW wind energy system on the environment which is developed and currently being undertaken. The operation of wind energy conversion systems does not appear to involve any unusual environment effects. As presently conceived, wind energy systems will produce no significant thermal or chemical effluents. Land requirements are minimal and compatible with many other land uses.

(BIBLIOGRAPHY, MICROCLIMATIC)

ST77 16063 WIND MOTORS

Sellman, D.L., Patent, Oct 26, 1976, US Patent 3,988,072, EDB-77:060896

Wind motors are described which are propelled by the impact of the wind against the vanes of an impeller wheel that have wind channeling devices that gather the wind from a large area and funnel it at increased density and pressure to apply multiplied impact against the impeller vanes.

(PATENT, CONFIGURATION)

ST77 16064 DIRECT AND INDIRECT ECONOMICS OF WIND ENERGY SYSTEMS RELATIVE TO FUEL

Sorensen, B., (Univ of Copenhagen, Denmark), Energy Dig, V 5:4-5, N6, Dec 1976

The author shows a power duration graph for a one-year period of the power output of a wind energy generator (WEG). In the graph, the yearly average output E//a//v is 136 W. m^2. The WEG is inoperative 31% of the year, and its power output exceeds the average during 42% of the time. The maximum output exceeds three times the average. The power duration curves for storage capacities ranging from 3 to 200 hours are added to the graph, and it is clear that the power fluctuations diminish rapidly as soon as even a small storage facility is added, and less rapidly when the storage capacity exceeds 24 hours. It would appear, that a WEG system with an energy storage facility of a capacity somewhere in the range 10-24 hours, would constitute a fully interchangeable alternative to fuel based base load plants. It is claimed that, with constant rising prices of fuel and rising costs of constructing nuclear power plants, the WEG promises to be an increasingly competitive energy source, especially considering its familiar unique advantages as a renewable, clean energy source.

(STORAGE, DENMARK)

ST77 16065 IS WINDPOWER READY TO TAKE OFF?

Stansell, J., Arch. Energiewirtsch., V 30:681-685, N8, Aug 1976, EDB-77:060887, In German

This article gives a brief survey about the position of wind energy development in the USA, in Denmark, and in Great Britain. The prototype of a wind engine which was built by

WESCO (Wind Energy Supply Company) to produce 140 kW is dealt with more intensively. Some data about the profitability of wind-energy plants are given.

(USA, DENMARK, GREAT-BRITAIN, ECONOMICS)

ST77 16066 SAILWING WINDMILL CHARACTERISTICS AND RELATED TOPICS

Sweeney, T.E., Nixon, W.B., Maughmer, M.D., Blaha, R., (Princeton Univ., NJ), NSF/RANN/GI-41891/PR/74/4, NSF/RA/N-75-054, 70 p., Mar 1975, AMS-1240, PB-265 328/4WE

The method of experimentally determining the performance of large scale windmill models mounted on a moving vehicle is discussed. As a result of the wind tunnel experiments, analysis, and the large scale vehicle work, an optimization of a particular rotor is described, as are the results of blade twist experiments as a method of RPM control. Because the wind tunnel models were necessarily small scale, rigid rotor blades were used; however, the large scale rotors tested and reported upon were of the Princeton Sailwing type. By means of dimensional analysis and by experiments, the significant tension coefficient for the trailing edge cable of the Sailwing rotor was determined and evaluated. This tension coefficient enables the design of such a rotor to be such that the luffing threshold can be avoided for any given set of conditions.

(WIND-TUNNEL MODELS, AERODYNAMICS)

ST77 16067 WINDMILLS: ENERGY BLOWING IN THE WIND

Tolleson, S., Elements, Midland, MI, V 3:32-41, N1, 1975, EDB-77:043295

The history of wind power is reviewed with its uncertain beginning, but believed to date as far back as 2000 B.C. The operation of the Smith-Putnam generator in Vermont from October 1941 to March 1945 marked the first synchronous generation of power from the wind. In 1951, Congress refused to appropriate funds for a prototype project. A windmill charges the batteries of a small experimental "urban car" with a range of 25 miles at the University of Oklahoma. In 1972, it was predicted that by the year 2000, about 19 percent of the U.S. energy requirements could be supplied by windpower utilized in windy areas. A workshop on wind energy conversion systems in 1973 sought to assess the present state of the art of wind energy systems technology and recommended concrete directions. The workshop was then divided into four committees and recommendations were provided for: wind characteristics and siting, rotor characteristics, energy storage and energy conversion systems, and applications. The NASA research programs on wind energy utilization are described.

(HISTORY, ECONOMICS, ENVIRONMENTAL-EFFECTS, RESEARCH-PROGRAMS, USA)

ST77 16068 DESIGN AND TESTING OF A PROTOTYPE SAVONIUS WIND MACHINE

Turnquist, R.O., Appl, F.C., (Kansas State Univ., Manhattan, KS), 1976, Oklahoma State University, Stillwater, OK, Frontiers of Power Technology Conference, EDB-77:060888

The various types of mechanical devices that have been tried or proposed to recover wind energy can be separated into two categories: vertical axis and horizontal axis machines. One of the simplest vertical axis wind machines is the Savonius type. During 1974, it was therefore decided to study the Savonius type wind machine at Kansas State University because of its simplicity and potential for a reasonably high efficiency. Since then, this decision has been further justified by results of recent wind tunnel tests of Savonius rotors. Design details are summarized. Results indicate that efficiencies of 30 percent were reached, but with optimization, efficiencies of 37 percent could be attained.

(VERTICAL-AXIS, HORIZONTAL-AXIS, KANSAS, OPTIMIZATION, TEST)

ST77 16069 THE OPTIMUM CONFIGURATION OF ROTOR BLADES FOR HORIZONTAL WIND ENERGY CONVERTERS

Weber, W., (Kanner, Leo, Associates, Redwood City, CA), NASA-TT-F-17379, 17 p., Feb 1977, N77-17562/8WE

Considerations, procedures and some results relating to the problem of the aerodynamic configuration of rotor blades for wind energy converters are presented.

(AERODYNAMIC)

ST77 16070 STUDY OF ALASKAN WIND POWER AND ITS POSSIBLE APPLICATIONS

Wentink, T., Jr., (Alaska Univ., College, Geophysical Inst., AK), NSF/RA-760424, 14 p., Jan 20, 1976, PB-263 695/9WE

Extensive analytical studies on wind spectra were extended to the prediction of the monthly and average power output from specified windmills, based on only knowledge of the measured mean windspeed. For the Elektro windmill and 44 sets of long term Alaskan wind frequency data, the author calculated the expected mean powers. Then, from analytical considerations he predicted the expected mean power, with resulting errors of 0 to 7%.

ST77 16071 NEW ENGLAND WIND POWER - COASTAL OR MOUNTAIN

Widger, W.K., Jr., Derrickson, R.A., Jr., (Biospheric Consult Int, Inc), Power Eng, Barrington, IL, V 80:43-47, N12, Dec 1976

A comparative study is made of the wind power available in the coastal and immediate offshore area of the Gulf of Maine and on the exposed ridges and summits in or peripheral to the White Mountains and other New England ranges. It is concluded that the wind power available at elevations of about 3000 ft MSL or above equals or exceeds that available 50 or more miles offshore in the Gulf of Maine. There is no way to avoid day-to-day variability due to changing synoptic weather situations, but the higher elevations inland do appear to permit relatively steady seasonal average power generation, if the operating range is appropriately truncated.

(VARIABILITY, COMPARISONS)

ST77 16072 TORNADO-TYPE WIND ENERGY SYSTEM: BASIC CONSIDERATION

Yen, J.T., (Grumman Aerosp Corp, Bethpage, NY), ASME Pap, 11 p., 11 refs, Dec 5, 1976, for Meet, N76-WA/Ener-2

A general description of the concept, scaling laws, and wind tunnel test data have been covered in a previous paper. A basic thermodynamic consideration will be presented in this paper to gain a proper perspective of the overall performance of the new design. Some details of wind tunnel data, derivation of the scaling laws, and some recent results in flow visualization are also presented.

17,000 BIOMASS

ST77 17024 AGRICULTURAL AND FORESTRY WASTES: WORKSHOP NO. 2

(Washington Center, Washington, DC), Capturing the Sun Through Bioconversion, 1976, EDB-77: 041491

In addition to a concise summary of the conclusions reached by the panelists on the use of agricultural and forestry residues as an energy source, written comments were included on several aspects of the problems and possibilities. These comments were discussed: feasibility of using forest residues as fuels and as raw materials for producing petrochemical substitutes/ feasibility of silvaculture energy farms and residue utilization/ forests as a potential source of energy, pulping and lignocellulose utilization, methane generation from wastes, particularly swine manure/ bioconversion of agricultural and forestry wastes from the standpoint of reducing land, air, and water pollution, and energy potential from agricultural field residues.

(BIOMASS, FEASIBILITY-STUDIES)

ST77 17025 AGRICULTURAL RESOURCES INVESTIGATIONS IN NORTHERN ITALY AND SOUTHERN FRANCE (AGRESTE PROJECT) PROGRESS REPORT, 15 MAY-31 DEC 1976

(Commission of the European Communities, Ispra, Italy), NASA-CR-149876 PR-4, 35 p., Sponsored by NASA, Original contains color imagery, Original photography may be purchased from the EROS Data Center, Sioux Falls, SD, ERTS, E77-10129, N77-20537
Avail:NTIS

The author has identified the following significant results. The vegetation structure of rice was investigated and interpreted in dynamic terms as a significant factor governing the distribution of solar energy throughout the canopy and therefore conditions the final yield. Radiometric characteristics of rice culture were described for various stages of development in relation to the vegetation structure in an attempt to establish correlations between data of total biomass and of grain yield. Qualitative classification results were encouraging although the discrimination achieved was far from complete.

(BIOMASS)

ST77 17026 CONFERENCE ON CAPTURING THE SUN THROUGH BIOCONVERSION, PROCEEDINGS

Anon, (ERDA, Oak Ridge, TN), Conf on Capturing the Sun Through Bioconvers, Proc, Washington, DC, Mar 10-12, 1976, Publ by Washington, Cent for Metrop Stud, Washington, DC, 863 p., 1976

The general content presents a review of bioconversion techniques by which solar energy can be stored in plant forms, recovered from organic wastes, and transformed into fuels, foods and chemicals. The papers and discussions cover biomass sources, including urban and industrial wastes, agricultural and forestry wastes, land and fresh water farming, and ocean farming; bioconversion processes and products, including gaseous, liquid and solid fuels and related products; and overall impacts, including economic, social and environmental impacts.

(BIOMASS, OCEAN FARMING, ENERGY-FARMS, ECONOMIC, ENVIRONMENTAL-IMPACTS)

ST77 17027 ENERGY POTENTIAL FROM CONSTRUCTION AND DEMOLITION WOOD WASTES

(JACA Corp., Fort Washington, PA), 65 p., Apr 7, 1977, EPA/SW-138c, PB-265 392/1WE.
Energy shortages and the need to conserve natural resources have led the United States to examine its waste streams as sources of potential supplies of energy and reconstituted products. While solid waste energy potentials in the private sector have been examined in some detail, construction and demolition wastes have not heretofore received comparable study attention. Therefore, the first step in analyzing a reuse program is the development of the size and nature of the particular waste stream. The objective of this report was to determine the nationwide volume of construction and demolition wastes, and, in particular, the combustible fraction of wastes from these activities. Ancillary outputs of the study are annual generation rates by location, information on time variation in waste flows, and the distribution of wood fractions.

(UNITED-STATES)

ST77 17028 INTERNATIONAL BIOMASS ENERGY CONFERENCE

(Biomass Energy Institute, Winnipeg, Manitoba), 1973, EDB-77:060326
Separate abstracts were prepared for 11 of the 17 papers presented.

ST77 17029 AGRICULTURAL AND BIOLOGICAL APPLICATIONS IN AN INTEGRATED SOLAR ENERGY SYSTEM

Abdel-Hameed, M.F., El-Difrawi, A.A., (North Illinois Univ, DeKalb, IL), Heliotech and Dev, Proc of the Int Conf, Dhahran, Saudi Arabia, Nov 2-6, 1975, Publ by Dev Anal Assoc, Cambridge, MA, V 2:249-273, 47 refs, 1976
The agricultural and biological applications are designed to utilize fresh water produced at various stages of the cycle and to investigate: cultivation of arable and marginal soils; production of high yield-high protein strains; increased production of conventional animal proteins; production of unconventional but edible animal proteins using solar arks; photo-synthesizing animal cell cultures; solar energy for petrochemical food sources; and management to coordinate various processes of the cycle. The objective is to develop integrated modules self-sufficient in food, water, and energy.

(BIOMASS)

ST77 17030 CROP, FORESTRY, AND MANURE RESIDUES: AN ENERGY RESOURCE

Alich, J.A., Jr., (Stanford Res Inst, Menlo Park, CA), Conf on Capturing the Sun Through Bio-convers, Proc, Washington, DC, Mar 10-12, 1976, Publ by Washington Cent for Metrop Stud, Washington, DC, p. 127-136, 1976
The paper reports on a study to develop a national, county-by-county computer data base pertaining to residues of crops, forest and wood products, and livestock and poultry manures. The residue inventory includes crop residues both in the field and at packing sheds but excludes food processing wastes other than bagasse, sugar beet pulp, hay and forage crops. In the case of manure, only manures produced in confinement are included. In the inventory of forestry residues, wood processing mill, logging, and bark from roundmill pulp production are considered.

(BIOMASS, UNITED-STATES, COMPUTER DATA-BASE, RESIDUE-INVENTORY)

ST77 17031 SYNTHETIC FUELS FROM SOLID WASTES AND SOLAR ENERGY

Antal, M.J., Jr., (Princeton University, Princeton, NJ), Feber, R.C., Tinkle, M.C., (California, University, Los Alamos, NM), In World Hydrogen Energy Conference, 1st, Miami Beach, FL, Mar 1-3, 1976, Proceedings, University of Miami, Coral Gables, FL, Pergamon Press, New York, NY, V 1:3A-69-3A-88, 1976, U.S. Environmental Protection Agency, EPA-IAG-0646, N77-21565, A77-33326 14-44, A77-33336
The basic reaction by which organic solid wastes in the presence of steam yield hydrogen and carbon dioxide is noted, and the possibilities of developing processes based on it for the production of significant amounts of hydrogen are examined. In particular, the option using solar tower as the heat source is discussed. Heating requirements are analyzed, and possible hydrogen production efficiency for a given system is roughly estimated to be at least 70%. An estimate of the overall economics of the system is provided.

(HYDROGEN-BASED ENERGY, ECONOMICS, THERMAL-POWER, BIOMASS)

ST77 17032 SOLAR ENERGY FROM CHEMISTRY

Archer, M., Indian East. Eng., V 117:57-59, N2, Feb 1975, EDB-77:041477
The possible development of photochemical and photoelectrochemical processes to convert solar energy into synthetic fuels and electric power is discussed.

(PHOTOVOLTAIC, BIOMASS)

ST77 17033 MASS CULTIVATION OF ALGAE A FUTURE SOURCE OF PROTEIN AND ENERGY

Badour, S.S., (Univ. of Manitoba, Winnipeg, Manitoba), 1973, Biomass Energy Inst., Winnipeg, Manitoba, International Biomass Energy Conference, EDB-77:061666

Microalgae (e.g., Chlorella and Scenedesmus) can grow photo-, mixo- or hetero-trophically in mass cultures. Depending on the technology adopted for their cultivation, the resulting algal biomass can be used for various nutritional purposes or as valuable raw material for industry. Evidence now exists that algal protein from clean mass cultures can be mixed with meals as an ingredient of high nutritional value. Fats, vitamins, and enzymes can also be prepared from these cultures. Oxygen, a product of algal photosynthesis in mixotrophic cultures on waste water, is essential for the decomposition of soluble organic material by aerobic bacteria. By this process wastes are treated, water is reclaimed and sufficient foodstuff is produced for livestock and for the enrichment of aquaculture. Production of methane by the fermentation of algal biomass recovered from these cultures (sewage ponds) has been also anticipated. The experiments conducted in this field of applied phycology in Czechoslovakia, Germany, Japan and U.S.A. are recapitulated and algal products are evaluated as future sources of food and energy.

(BIOMASS, CZECHOSLOVAKIA, GERMANY, JAPAN, U.S.A.)

ST77 17034 SYSTEMS STUDY OF FUELS FROM GRAINS AND GRASSES. QUARTERLY PROGRESS REPORT, JULY-OCTOBER 1976

Benson, W., Allen, A., Athey, R., McElroy, A., (Midwest Research Inst., Kansas City, MO), Nov 15, 1976, DSE/3729--1, EDB-77:060389
Avail:NTIS HC$4.50

The specific objectives of the project are to determine on a geographic basis the current and potential USA production capability for grain and grass crops, to perform a preliminary screening of conversion processes, and to perform preliminary technical and economic feasibility analyses. The results obtained to date on biomass production, conversion processes, and data management are reported.

(BIOMASS, FEASIBILITY-STUDIES, PYROLYSIS, RESEARCH-PROGRAMS)

ST77 17035 SOLAR ENERGY UTILIZATION - THE PHOTOCHEMICAL APPROACH

Broda, E., (Univ of Vienna, Austria), Heliotech and Dev, Proc of the Int Conf, Dhahran, Saudi Arabia, Nov 2-6, 1975, Publ by Dev Anal Assoc, Cambridge, MA, V 1:471-480, 13 refs, 1976

The essential feature of bacterial and plant photosynthesis is the light-powered transfer of an electron to a compound with a standard redox potential about equal to that of hydrogen in neutral solution. A hypothesis is put forward on how photolysis evolved in the history of organisms. Theoretically, it is possible to photolyse water into hydrogen and oxygen without participation of organisms, or even biogenic substances. This necessitates the application of the membrane principle where hydrogen and oxygen are set free in different loci. Hydrogen could be used as a basis for technical hydrogen economy.

(REDOX-POTENTIAL, HYDROGEN-ECONOMY, BIOMASS)

ST77 17036 HYDROCARBONS VIA PHOTOSYNTHESIS

Calvin, M., (California Univ., Berkeley, Lawrence Berkeley Lab., CA), Sept 15, 1976, LBL--5387, EDB-77:047250
Avail:NTIS HC$4.50

Photosynthesis, both natural and as a model process, is examined as a possible annually renewable resource for both material and energy. The conversion of carbohydrate from cane and other sources through fermentation alcohol to hydrocarbon may again become economic in the light of improved fermentation technology and the rising price of hydrocarbon. Even the direct photosynthetic production of hydrocarbon from known sources (Hevea, etc.) or newly bred ones seems possible in view of the large number of species and new techniques of plant cell cloning which have already been successful on sugar cane. Analysis has already begun of other species of Euphorbia which can grow in the United States, especially in California. The molecular weight range of their polyisoprenes is much lower than that for Hevea, being about 10,000 to 30,000 instead of 500,000 to 2,000,000. Since only a few species of Euphorbia have been analyzed and no breeding experiments have been done, both the molecular weight and yield of hydrocarbon may be expected to be very markedly influenced by the new procedures. Finally, more distantly, synthetic systems constructed on the basis of our growing knowledge of the natural photosynthetic processes may produce fuel, fertilizer, and power. From our current knowledge of the natural quantum conversion process in green plants we can envisage several photoelectron transfer processes. Some steps in this sequence of transfer have already been demonstrated in synthetic systems. However, the actual physical construction of such a complete system is a more complex task.

(RENEWABLE-RESOURCE, ECONOMIC, BIOSYNTHESIS, BIOMASS, OVERVIEW)

ST77 17037 CONFERENCE ON BIOCONVERSION, GENERAL CHAIRMAN'S SUMMARY, MARCH 12, 1976

Carey, W., (American Association for the Advancement of Science, Washington, DC), Capturing the Sun Through Bioconversion, 1976, Washington Center, Washington, DC, EDB-77:041490
The conclusions reached by the conference fall into three main categories: the need for increased pilot projects, the need for overall impact statements, and the need for broad international cooperation. Each of these aspects is briefly discussed as it was considered by the conference members.

(ENVIRONMENTAL-EFFECTS, GLOBAL-ASPECTS, BIOMASS)

ST77 17038 BIOCONVERSION: OPPORTUNITIES UNLIMITED

Domenici, P., (Senate, Washington, DC), Capturing the Sun Through Bioconversion, 1976, Washington Center, Washington, DC, EDB-77:053811
The contribution that bioconversion can make to the total energy needs of the Nation while dealing effectively with a serious pollution problem is outlined. The special benefits and advantages associated with the process are tabulated.

(POLLUTION, BIOMASS, ECONOMICS)

ST77 17039 LAND AND FRESH WATER FARMING

Greeley, R.S., (Mitre Corp, Energy Resour & Environ Syst Div), Conf on Capturing the Sun Through Bioconvers, Proc, Washington, DC, Mar 10-12, 1976, Publ by Washington Cent for Metrop Stud, Washington, DC, p. 179-208, 23 refs, 1976
In this paper five scenarios are developed which assume the use of fresh water areas for algae production for use as livestock feed and the consequent use of former grazing land for biomass production for energy and fuels. The results indicate a potential energy production from biomass in the year 2,005 of between 4 and 8 x 10^{15} Kcal. This would represent up to 5% of U.S. energy demand estimated for the year 2,005. Additional biomass for energy and fuel production might be available from agricultural, forest and municipal wastes and from marginal forest lands.

(BIOMASS, ALGAE-PRODUCTION)

ST77 17040 INQUIRY INTO BIOLOGICAL ENERGY CONVERSION

Hollaender, A., Monty, K.J., Pearlstein, R.M., Schmidt-Bleek, F., Snyder, W.T., Volkin, E., (Tennessee Univ., Knoxville, TN), Dec 1972, TIC, NP--19658, EDB-77:034861
No abstract available

(BIOSYNTHESIS, ECONOMICS, HYDROGEN, PHOTOSYNTHESIS, BIOMASS)

ST77 17041 BIOLOGICAL SOLAR ENERGY CONVERSION - APPROACHES TO OVERCOME YIELD, STABILITY AND PRODUCT LIMITATIONS PROGRESS REPORT, 1 APR-30 SEPT 1976

Kok, B., Fowler, C.F., Hardt, H.H., Radmer, R.J., (Martin Marietta Labs., Baltimore, MD), NSF AER-73-03291, NSF/RA-760313 PR-3, 42 p., MML-TR-76-16C, PB-261910/4, N77-22688
Avail:NTIS
The rate inhibition induced by treating chloroplasts with glutaraldehyde is studied. The decay of activity of isolated chloroplasts stored in the dark is studied as a function of pH. The program concerning the size of the photosynthetic unit in relation to the utilization of high light includes studies of nitrogen-starved algae and the possible role of carotenoids which accumulate in these cells. No specific photochemical process driven by carotenoids in these organisms was detected. Comparative studies of the light gathering systems in the bundle sheath and mesophyll cells of C4 plants are initiated.

(CHLOROPLASTS, PHOTOSYNTHESIS, ENERGY-TECHNOLOGY, BIOMASS)

ST77 17042 REPORTER'S SUMMARY OF WORKSHOP NO. 10 HIGHLIGHTS

Krebs-Leidecker, M., (Congressional Research Service, Washington, DC), Capturing the Sun Through Bioconversion, 1976, Washington Center, Washington, DC, EDB-77:045127
The process of technology assessment and the environmental and social impacts of specific technologies are discussed.

(ENVIRONMENTAL-EFFECTS, SOCIO-ECONOMIC-FACTORS, BIOMASS, COMPARISONS)

ST77 17043 EUCALYPTUS FUEL PLANTATION TO GENERATE ELECTRICITY

Mariani, E.O., (Marelco, Inc, Beverly Hills, CA), Heliotech and Dev, Proc of the Int Conf, Dhahran, Saudi Arabia, Nov 2-6, 1975, Publ by Dev Anal Assoc, Cambridge, MA, V 1:753-758, 1 ref, 1976

Planting Eucalyptus trees, harvested, processed and used as fuel in a steam-electric-power plant, is one of the simplest and straightforward solutions to use solar energy.

(BIOMASS)

ST77 17044 STATEMENT AT BIOCONVERSION CONFERENCE

Marvin, H., (ERDA, Washington, DC), Capturing the Sun Through Bioconversion, 1976, ERDA Solar Energy Div., Washington Center, Washington, DC, EDB-77:053810

ERDA's role in the development of bioconversion processes is briefly outlined. The primary role will be one of cooperation with industry in research, development, and demonstration.

(BIOMASS, ENERGY POLICY, RESEARCH-PROGRAMS, UNITED-STATES, ERDA)

ST77 17045 BIOCONVERSION OF SOLAR ENERGY IN SALT WATER - PHOTOSYNTHETIC HYDROGEN PRODUCTION SYSTEMS

Mitsui, A., (Miami Univ., FL), (Rosenstiel School of Marine and Atmospheric Science), In Its 1st World Hydrogen Energy Conf. Proc., Sponsored in Part by NSF, V 2:23, See N77-21591 12-44, N77-21603, A77-33369
Avail:NTIS

Hydrogen photoproduction via marine photosynthetic systems is reviewed. Special emphasis is placed on the economic and logistical importance of using salt water as the hydrogen (proton) and electron donor in such a system. In addition, the advantages of using marine photosynthetic microorganisms are discussed from the standpoint of maintaining stable mass cultures with high solar conversion efficiencies. A program is outlined for the multiple utilization of hydrogen producing mass cultures, including harvesting cultures for food production, using cellular products for methane production, and isolating metabolically active cellular products for medical use.

(HYDROGEN-BASED ENERGY, PHOTOSYNTHESIS, BRINES, ENERGY-TECHNOLOGY)

ST77 17046 LONG RANGE CONCEPTS: APPLICATIONS OF PHOTOSYNTHETIC HYDROGEN PRODUCTION & NITROGEN FIXATION RESEARCH

Mitsui, A., (Univ of Miami, FL), Conf on Capturing the Sun Through Bioconvers, Proc, Washington, DC, Mar 10-12, 1976, Publ by Washington Cent for Metrop Stud, Washington, DC, p. 653-672, 17 refs, 1976

One of the promising new areas in solar energy bioconversion research is the utilization of natural products from photosynthetic marine microorganisms. However, the natural solar conversion efficiency of these two processes is too low to permit profitable exploitation of these resources. It will therefore be necessary to engage in a research effort aimed at increasing this efficiency. Such a program would include: the surveying of the marine habitat for microorganismal species which exhibit high solar conversion efficiency; the chemical and physical regulation of cellular environments in order to increase efficiency; genetic alteration of cells; and the design of a cell-free system of photo-bioconversion through which the metabolic limitations of the cellular milieu could be avoided. The successful completion of such a program of research would generate a new source of fuel and food.

(MARINE-BIOLOGY, BIOMASS)

ST77 17047 LONG-RANGE CONCEPTS: REPORTER'S NOTES FOR WORKSHOP NO. 9

Mukherjee, T., (NSF, Washington, DC), Capturing the Sun Through Bioconversion, 1976, EDB-77:041494

The innovative long-range concepts discussed are direct conversion of solar energy to electrical energy by biological means, biological fixation of nitrogen, controlled-environmental agriculture for production of proteins and energy, production of food and fuel from marine algae, and use of oleoresin for fuels and industrial chemicals.

(MARINE ALGAE, PHOTOSYNTHESIS, BIOMASS)

ST77 17048 ECOLOGY OF BIOCONVERSION

Peterson, R.W., (Council on Environmental Quality, Washington, DC), Capturing the Sun Through Bioconversion, 1976, Washington Center, Washington, DC, EDB-77:047253

After a description of the ecological degradation occurring both in the industrialized areas of the world and in the least industrialized areas of the world, it is suggested that biogasification of animal and crop residues and municipal wastes by anaerobic fermentation might be a partial answer to the needs of both areas.

(BIOGASIFICATION, BIOMASS)

ST77 17049 WHEN THE OIL RUNS OUT - A SURVEY OF OUR PRIMARY ENERGY SOURCES AND THE FUEL WE CAN MAKE FROM THEM

Reed, T.B., Conf on Capturing the Sun Through Bioconvers, Proc, Washington, DC, Mar 10-12, 1976, Publ by Washington Cent for Metrop Stud, Washington, DC, p. 366-388, 25 refs, 1976

Woodgas, methanol and pyrolysis oils could fill most needs when the oil runs out, and they can be made in sufficient quantity from municipal, agricultural and forest sources. Slurry fuels offer particular advantages for storage and transport, while synthetic gasoline from methanol can be used for airplane fuels. Since biomass is initially as widely distributed as the sunshine, it is desirable to match the scale of biomass synthetic fuel plants to solar production, and a number of factors are discussed which can make this decrease of scale economical in the larger human sense.

(SYNTHETIC-FUELS, BIOMASS, OVERVIEWS)

ST77 17050 GASEOUS FUELS

Robertson, E.E., Lapp, H.M., (Biomass Energy Inst Inc, Winnipeg, Manitoba), Conf on Capturing the Sun Through Bioconvers, Proc, Washington, DC, Mar 10-12, 1976, Publ by Washington Cent for Metrop Stud, Washington, DC, p. 299-312, 1976

The paper discusses the background of a current program that is appraising renewable biomass energy in general, and that is concentrating on the possibility of establishing a perpetual supply of its main component, i.e. methane, through solar powered processes. This paper lists some of the principal serious objections to the ultimate carrying capacity of the biosphere's resources to maintain a perpetual solar powered supply of methane, hydrogen and/or carbon monoxide from renewable biomass. Still to be answered are questions ranging from fundamental gaps in knowledge of microbiology to incomplete statistical, systems and procedural factors required in order to conduct meaningful economic viability studies in specific situations.

(BIOMASS, PERPETUAL-SUPPLY, METHANE, ECONOMIC)

ST77 17051 DESIGN, OPERATION AND ECONOMICS OF THE ENERGY PLANTATION

Szego, G., (Intertechnol Corp, Warrenton, VA), Conf on Capturing the Sun Through Bioconvers, Proc, Washington, DC, Mar 10-12, 1976, Publ by Washington Cent for Metrop Stud, Washington, DC, p. 217-240, 1976

The plantation is a means for producing fuels by collecting and storing solar radiation in plants grown purposely for their fuel value. Suitable species include certain fast-growing deciduous woody species as well as certain warm-season grasses. A mathematical model has been developed for predicting the average annual sustained yield. Characteristically, this yield is maximized when the planting density is between 5,000 and 11,000 plants per acre, and the harvest schedule consists of a first harvest when the planting is one year old, followed by five to seven additional harvests at two- to four-year intervals thereafter. The paper also discusses manpower and equipment requirements, and costs.

(BIOMASS, ENERGY-FARMS, MATHEMATICAL-MODEL, MANPOWER)

ST77 17052 LONG-RANGE CONCEPTS

Valentine, R., (Univ. of California, Davis, CA), Capturing the Sun Through Bioconversion, 1976, Washington Center, Washington, DC, EDB-77:047291

The factors limiting conversion efficiency in plants, the possible achievable efficiency, and the conditions necessary to achieve this efficiency are discussed. Then a concept of controlled-environment agriculture (plastic greenhouse in the desert) for production of protein and energy is described.

(EFFICIENCY, GREENHOUSE, BIOMASS, PHOTOSYNTHESIS)

ST77 17053 FUEL AND ENERGY PRODUCTION BY BIOCONVERSION OF WASTE MATERIALS - STATE-OF-THE-ART

Ware, S.A., (Ebon Research Systems, Silver Springs, MD), 78 p., Aug 1976, EPA/600/2-76/148, PB-258 499/3WE

This report is a state-of-the-art summary of biological processes for converting waste cellulosic materials (agricultural, municipal and lumbering wastes) to fuels. It indicates the locations and quantities of suitable wastes and discusses the status of the current processing schemes. The processes discussed are: Acid hydrolysis followed by fermentation; enzyme hydrolysis followed by fermentation; anaerobic digestion of manure and municipal solid waste; and, biophotolysis.

(BIOMASS, PROCESS-REVIEW)

ST77 17054 CURRENT STATE OF THE SCIENCE OF PHOTOSYNTHESIS IN RELATION TO BIOMASS ENERGY PRODUCTION

Waygood, E.R., (Univ. of Manitoba, Winnipeg, Manitoba), 1973, International Biomass Energy Conference, Biomass Energy Inst., Winnipeg, Manitoba, EDB-77:060544

All natural photosynthesis follows the generalized equation: $CO_2 + 2H_2A$ yields $(CH_2O) + 2A + H_2O$ where H_2A may be water, hydrogen sulfide or elemental H_2. Some bacteria utilize organic hydrogen donors strictly and can produce CO_2 and H_2. The potential of green algae for H_2 production is discussed. Biomass productivity is compared between the so-called non-efficient (C_3) plants and the efficient C_4 plants as well as green algae. It is recommended that agricultural biomass production be complemented by the mass cultivation of algae on waste waters or sewage disposal systems. Algae are more suitable for genetical engineering research since their life cycle is completed in a matter of days. Recommendations for the initial stages of future research on the mass cultivation of algae are discussed.

(ALGAE, HYDROGEN-PRODUCTION)

ST77 17055 OCEAN FARMING

Wilcox, H., (Nav Undersea Cent, CA), Conf on Capturing the Sun Through Bioconvers, Proc, Washington, DC, p. 225-276, 14 refs, Mar 10-12, 1976, Publ by Washington Cent for Metrop Stud, Washington, DC, 1976

This paper describes the Ocean Energy and Food Farm Project, which promises by 1985-1990 to be able to demonstrate a 100,000 acre ocean farm yielding some 16 million Btu per year of food plus some 160 million Btu (160 thousand standard cubic feed) of methane per year for each acre of cultivated ocean. On this basis, the total food and natural gas energy presently being consumed by the United States each year could be produced from a square of ocean approximately 470 miles on a side.

(MARINE BIOLOGY, SEAWEEDS, BIOMASS)

18,000 RESIDENTIAL POWER

ST77 18009 APPARATUS FOR ENHANCING THE OUTPUT OF PHOTOVOLTAIC SOLAR CELLS

Beam, B.H., Parabolic Concentrator with Cooling System, Patent, Oct 26, 1976, US Patent 3,988,166, EDB-77:060532

An array of photovoltaic cells and a parabolic concentrator for concentrating solar energy onto the cells is described. A watertight chamber includes a solar energy pervious window adjacent the focus of the parabolic concentrator. The solar cell array is disposed within the chamber in alignment with the window. A quantity of water is disposed in the chamber, the quantity being sufficient to absorb heat energy so as to limit the temperature rise of the solar cell array during periods of solar energy impingement thereon. The watertight chamber has sufficient external surface area that the heat energy stored therein is transferred away during nonsolar energy producing periods of the diurnal cycle.

(PATENT, COOLING, PARABOLIC-REFLECTORS, RESIDENTIAL)

ST77 18010 SOLAR ELECTRIC AND THERMAL CONVERSION SYSTEM IN CLOSE PROXIMITY TO THE CONSUMER

Boer, K.W., (Univ of Delaware, Newark, DE), AIAA/AAS Sol Energy for Earth Conf, Pap, Los Angeles, CA, Apr 21-24, 1975, Publ by AIAA, New York, NY, 6 p., 14 refs, 1975, Pap 75-628

Cell parameters relevant for combined solar conversion are presented. Critical issues, such as production yield, life expectancy, stability of performance, are discussed. Systems design parameters related to operating temperatures are analyzed. First results obtained on SOLAR ONE, the experimental house of the University of Delaware, are given. Economic aspects are discussed. Different modes of operation are discussed in respect to the power utility and consumer incentives.

(BUILDINGS, ECONOMIC, RESIDENTIAL)

ST77 18011 PERFORMANCE ANALYSES OF COMBINED HEATING AND PHOTOVOLTAIC POWER SYSTEMS FOR RESIDENCES

Wolf, M., (Univ. of Pennsylvania, Philadelphia, PA), Energy Convers., V 16:79-90, N1-2, 1976, EDB-77:060651

The performance of a combined solar photovoltaic and heating system for a single family residence has been analyzed over a full year, using hourly U.S. Weather Bureau data for insolation and environmental temperature for Boston, 1963. The collector analyzed is a flat plate thermal collector with heat transfer to the load via a liquid loop. The collector contains in lieu of the usual absorber surface a silicon solar array. The analysis has been carried out by use of existing detailed programs for hourly computation of the building heat load, of solar heating system performance, and of solar photovoltaic system performance. The optical properties of the photovoltaic array were used for the absorber plate in the thermal collector performance evaluation, and the available energy input to the absorber was reduced by 10 percent to account for the electrical energy taken out, as a first order approximation. The thus

obtained hourly absorber temperatures were used in the computation of photovoltaic array performance. The hourly electrical load has been synthesized. The analysis has shown the combination system to be a viable approach. It will require a means for temperature control while heat energy is available in excess of load and is being dumped into the environment. Several system design parameters were varied for a sensitivity analysis.

19,000 LARGE SCALE PHOTOVOLTAIC, HYDROGEN PRODUCTION, AND OTHER

ST77 19030 ON THE STORAGE OF SOLHYDROGEN

Abdel-Aal, H.K., Nazmy, M.Y., (Univ of Pet & Miner, Dhahran, Saudi Arabia), Heliotech and Dev, Proc of the Int Conf, Dhahran, Saudi Arabia, Nov 2-6, 1975, Publ by Dev Anal Assoc, Cambridge, MA, V 1:418-428, 21 refs, 1976

Methods of storing hydrogen produced by solar energy are: liquid hydrogen for overseas transportation; liquid ammonia which has to be cracked to give H_2 back; or absorbed hydrogen in metal hydrides such as magnesium or iron-titanium hydride. The availability of metals such as magnesium if recovered economically from sea water, can reinforce the potential of metal-hydrides for storing hydrogen.

(METAL-HYDRIDES)

ST77 19031 THE NITINOL ENGINE

Ashbee, K., Frank, F.C., (Bristol Univ, England), Energy Dig, V 5:22-24, N6, Dec 1976

Nitinol is a nickel-titanium alloy which, when cold, can be bent easily between the fingers and stays bent under a weak recovery force. However, when heated above its transition temperature it reverts vigorously to its original shape. Nitinol, which seems to behave plastically when cold, is said to exhibit 'mechanical memory." An engine was setup to pump water. The pump is valveless and is operated by the engine's rocking motion. The device raises water at a rate of one litre/hour through a height of 3 cm with a thermal efficiency of 1.5%, under practical conditions. There is no difficulty in using the heat of the sun to warm water to 30°C above the temperature of the environment, and 1.5% of the solar energy falling on a square metre is 15 watts, enough to lift two gallons of water a minute from a depth of 10 metres.

(HEAT-ENGINES, MECHANICAL-MEMORY, IRRIGATION-PUMP)

ST77 19032 PHOTOVOLTAIC SYSTEMS USING SUNLIGHT CONCENTRATION

Backus, C.E., Evans, D.L., Ralph, E.L., (Arizona State Univ, Tempe, AZ), Heliotech and Dev, Proc of the Int Conf, Dhahran, Saudi Arabia, Nov 2-6, 1975, Publ by Dev Anal Assoc, Cambridge, MA, V 1:653-667, 6 refs, 1976

Main factors affecting the cost and efficiency of photovoltaic systems using sunlight concentration such as cell encapsulation, bonding materials, and concentrators are evaluated, and heat rejection is analyzed. The component characteristics are incorporated into a computer program to simulate system performance and conduct cost analysis. Preliminary results are presented.

(HEAT-REJECTION, COMPUTER-PROGRAM, SYSTEM-PERFORMANCE)

ST77 19033 SOLAR ENERGY CONVERSION BY WATER PHOTODISSOCIATION

Balzoni, V., Gleria, M., (Univ., Bologna), Science, V 189:852-856, N4206, Sept 12, 1975, EDB-77:047315

A review showed that transition metal complexes are, in principle, suitable catalysts for closed-cycle hydrogen generation processes based on endothermic photochemical reactions. The most interesting cycles are those involving metal hydride complexes or binuclear complexes in which the two metal atoms are bound into a macrocyclic ligand. The review also covers the requirements of a cycle/direct photodissociation/ and simple chemical cycles.

(METAL-HYDRIDE, HYDROGEN-PRODUCTION, PHOTOLYSIS)

ST77 19034 SOLAR ENERGY CONVERTER WITH WASTE HEAT ENGINE

Bell, R.L., Patent, Jan 11, 1977, US Patent 4,002,031, EDB-77:060534

A solar energy converter uses gallium arsenide photovoltaic cells to convert light to direct current. Optical concentrators reduce the needed area of cells. Gallium arsenide retains high conversion efficiency up to several hundred degrees, so the waste heat may be used to produce mechanical power in a Rankine cycle engine.

(PATENT, SOLAR-CELLS, RANKINE-CYCLE, CONCENTRATORS)

ST77 19035 THE THEORY OF HYDROGEN PRODUCTION IN A PHOTOELECTROCHEMICAL CELL

Bockris, J.O., Uosaki, K., (South Australia, Flinders University, Bedford Park, Australia), In World Hydrogen Energy Conference, 1st, Miami Beach, FL, Mar 1-3, 1976, Proceedings, University of Miami, Coral Gables, FL, Pergamon Press, New York, NY, V 2:5B-1-5B-30, 1976, A77-33326 14-44, A77-33370, N77-21604

Theoretical expressions for photocurrents of P-type and N-type semiconductors are set up under estimation that the rate-determining step is discharge process in both cases. The photoelectrochemical process in semiconductors is considered in terms of the solid state and quantum electrochemical processes involved. Photocurrents of individual electrodes were calculated by using the characteristics of semiconductors, e.g., energy gap, electron affinity, etc. The calculated results for N-type semiconductors are rather low in many cases. The experimental high quantum efficiency for TiO_2 is explained by considering the existence of surface state. Photocurrent for whole cell is also considered, and hydrogen production rate under solar spectrum by a typical cell is calculated.

(ELECTRON-TRANSFER, QUANTUM-MECHANICS)

ST77 19036 PERFORMANCE DATA FOR A TERRESTRIAL SOLAR PHOTOVOLTAIC/WATER ELECTROLYSIS EXPERIMENT

Costogue, E.N., (California Institute of Technology, JPL, Pasadena, CA), Yasui, R.K., (TRW, Inc., Cleveland, OH), Solar Energy, V 19:205-210, N2, 1977, International Solar Energy Society, International Solar Energy Congress and Exposition, Los Angeles, CA, July 28-Aug 1, 1975, NAS7-100, A77-30321

A description is presented of the equipment used in the experiment, taking into account the surplus solar panel from the Mariner 4 spacecraft which was used as a solar array source and an electrolytic hydrogen generator. Attention is also given to operational considerations and performance data, system considerations and aspects of optimization, and large-scale hydrogen production considerations.

(ENERGY-TECHNOLOGY, HYDROGEN-BASED ENERGY, LARGE-SCALE)

ST77 19037 ELECTROCHEMICAL SYSTEM FOR THE PHOTOLYSIS OF WATER BY MEANS OF SOLAR ENERGY

Gerischer, H., (Max-Planck Ges, Berlin-Dahlem, Germany), Ber Bunsenges Phys Chem, V 80:1046-1048, N11, 10 refs, Nov 1976, In German with English abstract

Redox reactions at semiconductors can proceed via the conduction- or the valence-band. The energetic conditions are discussed which are necessary to allow the reduction of water by electrons of the conduction band and the oxidation of water by holes of the valence band. Both electric charge carriers are generated by light absorption. Conditions for an optimal efficiency of this photolytic process are estimated.

(REDOX-REACTIONS, OPTIMIZATION)

ST77 19038 INVESTIGATION OF A TiO_2 ELECTROLYTE SOLAR CELL AND THE PHOTOCATALYTIC WATER DECOMPOSITION

Gissler, W., (Joint Nucl Res Cent, Ispra, Italy), Heliotech and Dev, Proc of the Int Conf, Dhahran, Saudi Arabia, Nov 2-6, 1975, Publ by Dev Anal Assoc, Cambridge, MA, V 1:708-719, 24 refs, 1976

To demonstrate the feasibility of semiconductor/electrolyte solar cells a TiO_2 0.1 m Na_2SO_4Pt cell is constructed and tested. The quantum efficiency of the cell was 85 percent. This rather high value could be achieved by a systematic analysis of different sample preparation techniques. However, due to the large band gap of 3.06 eV, the solar energy conversion efficiency is small. The possibility of a photocatalytic water decomposition is investigated at very high light intensities corresponding to about 100 Sun intensities. The result is negative.

(QUANTUM-EFFICIENCY, HYDROGEN-PRODUCTION)

ST77 19039 NONBIOLOGICAL PHOTOCHEMICAL ENERGY CONVERSION, CAN IT COMPETE

Harrigan, R.W., (Sandia Labs., Albuquerque, NM), 1976, SAND--76-5763, EDB-77:047340 Avail:NTIS HC$3.50

Solar photochemical energy conversion has much in common with solar thermal energy conversion systems. As a result, it is not to be expected that photochemical systems will be much less expensive than solar thermal systems. Since direct fuel production is unique to the photochemical system, the most promising application areas will be in those sectors such as transportation having particular needs for fuels. The results of an analysis of a combined photovoltaic/thermal system applied to meeting a community energy demand are reported.

(HYDROGEN-PRODUCTION, ECONOMICS)

ST77 19040 IMPROVED SOLAR ENERGY CONVERSION EFFICIENCIES FOR THE PHOTOCATALYTIC PRODUCTION OF HYDROGEN VIA TiO_2 SEMICONDUCTOR ELECTRODES

Houlihan, J.F., (Pennsylvania State Univ., Sharon, PA), Madacsi, D.P., Walsh, E.J., Mulay, L.N., Mater. Res. Bull., V 11:1191-1198, N9, Sept 1976, EDB-77:047120

Overall solar energy conversion efficiencies of at least 0.8 percent, somewhat greater than those previously reported, have been obtained in the photocatalytic production of hydrogen using TiO_2 semiconductor electrodes prepared by heat treatment of titanium metal foils. A shift in the threshold frequency for hydrogen evolution toward energies slightly lower than the 3.02 eV bandgap of TiO_2 was observed for some of these electrodes. This result supports the possibility of utilizing a greater portion of the solar spectrum, thereby increasing overall conversion efficiency even further. A tentative explanation of this shift involves the presence of mixed phases of the titanium-oxygen system (Magneli Phases) in the semiconducting film.

(EFFICIENCY, HYDROGEN-PRODUCTION, PHOTOLYSIS, TITANIUM-OXIDES)

ST77 19041 AN INQUIRY INTO BIOPHOTOLYSIS OF WATER TO PRODUCE HYDROGEN

Lien, S., San Pietro, A., (Indiana Univ. at Bloomington, IN), NSF/RA-760417, 58 p., 1976, PB-263 680/1WE

This report is intended to serve as an assessment of solar energy. It is concerned with the photoconversion apparatus of green plants that serves to convert absorbed solar energy into chemical free energy and thereby provides a non-polluting energy source - gaseous hydrogen. This process is the biophotolysis of water to yield hydrogen (and oxygen). Relevant information available in the literature is presented under three main topics: (1) Energy Efficiency of Biophotolysis of Water includes a discussion of the theoretical maximal energy conversion efficiency of PETS (Photosynthetic Electron Transport System) and a departure from theoretical maximal efficiency; (2) Stability of PETS includes a discussion of photochemical degradation of PETS - photoinhibition and photo-oxidation, inactivation of PETS, and stabilization of PETS in vitro; and (3) Hydrogenase includes a discussion of the occurrence and general properties of hydrogenase, photoproduction of hydrogen, the oxygen sensitivity of hydrogenase, and the preparation and stabilization of hydrogenase.

(CONVERSION EFFICIENCY)

ST77 19042 AEROTHERMIC POWER PLANT WITH ARTIFICIAL CYCLONE

Nazare, E., Heliotech and Dev, Proc of the Int Conf, Dhahran, Saudi Arabia, Nov 2-6, 1975, Publ by Dev Anal Assoc, Cambridge, MA, V 1:773-776, 1976

A tower of the venturi type is conceived so that air convected by solar heat be guided into accelerator ducts. The whirl having been thus started, the Coriolis forces due to the rotation of the earth sustain the cyclone rotation. With a difference of temperature of 50°C, a 300 m high tower could produce 650 mW of electricity. For equal power a tower will cost 4 times less than a nuclear power plant. It can also complement the conventional plants by recuperating part of the 60 percent thermic energy lost to the atmosphere. The cycle being natural, it will not create any ecology disorder and can in certain cases constitute a climatic regulator.

(VENTURI-TYPE, CORIOLIS-FORCES, ECONOMICS)

ST77 19043 WATER-SPLITTING-SYSTEM SYNTHESIZED BY PHOTOCHEMICAL AND THERMOELECTRIC UTILIZATIONS OF SOLAR ENERGY

Ohta, T., Kamiya, N., Yamaguchi, M., Gotoh, N., Otagawa, T., Asakura, S., (Yokohama National University, Yokohama, Japan), In World Hydrogen Energy Conference, 1st, Miami Beach, FL, Mar 1-3, 1976, Proceedings, University of Miami, Coral Gables, FL, Pergamon Press, New York, NY, V 1:3A-19-3A-30, 1976, A77-33326 14-44, A77-33334

Valuable hybrid systems for hydrogen production by solar energy have been developed, and the system efficiency is estimated and discussed from various points of view. In order to split water into hydrogen and oxygen without draining out any by-products, a steady stream of the reacting materials should be maintained in the consecutive reaction processes, and if the system has a rate determining step, extra energy should be supplied to promote the reaction. In the Yokohama Mark 5, the efficiency of the thermoelectric device is as low as 5%; however, the overall efficiency of hydrogen production can be raised up to 20% by adding extra electric power. A hybrid system combining photochemical, thermochemical and electrochemical reactions are also discussed from energetic point of view.

(HYDROGEN-BASED ENERGY, THERMOELECTRIC, ENERGY-TECHNOLOGY)

ST77 19044 LABORATORY INVESTIGATIONS ON THERMOCHEMICAL HYDROGEN PRODUCTION

Pangborn, J., (Institute of Gas Technology, Chicago, IL), In Miami Univ. First World Hydrogen Energy Conf. Proc., V 1:24, Sponsored in part by the Am. Gas. Assoc., See N77-21552 12-44, N77-21580, A77-33348
Avail:NTIS

Detailed energy efficiency determinations were made for more than 90 theoretically possible hydrogen production cycles, and the reaction steps of at least 60 cycles were tested. Theoretical

studies and laboratory work indicate that important parameters are energy efficiency, energy sources, material corrosivity, hydrogen pressure capability, step rates, reaction kinetics, and material costs. One cycle that is experimentally workable and that exhibits many desirable characteristics - hydrogen pressure capability, high energy efficiency, and noncorrosive components - is based on the high temperature thermal decomposition of CdO. A high temperature solar furnace with a 1000 to 1200°C capability would be a suitable prime energy source.

(HYDROLYSIS, THERMOCHEMISTRY, EFFICIENCY, FURNACE)

ST77 19045 ELECTRICAL GENERATING SYSTEM

Porter, W.H., Wind, Waves, Solar, Patent, Oct 26, 1976, US Patent 3,988,592, EDB-77:060881
An electrical generating system is described in which a hermetically sealed flotation sphere, preferably constructed of plastic, is anchored to a sea bed. The sphere carries a circumferential fender on the outside thereof in which is located a plurality of screws open to seawater which generate electricity from the action of ground swells. A wind turbine is mounted on top of the sphere for generating electricity from wind action and a solar generator is disposed directly beneath the wind turbine and on the upper surface of the sphere for generating energy from solar heat. An air compressor is disposed beneath the sphere for generating electricity from tidal action.

(PATENT, THERMAL-POWER, TIDAL-POWER, WAVE, WIND)

ST77 19046 THERMO-CHEMICAL PRODUCTION OF HYDROGEN

Sayigh, A.M., Sabbagh, J.A., Abdul-Salam, E., Abdul-Azeem, E.M., (Univ of Riyadh, Saudi Arabia), Heliotech and Dev, Proc of the Int Conf, Dhahran, Saudi Arabia, Nov 2-6, 1975, Publ by Dev Anal Assoc, Cambridge, MA, V 1:429-434, 8 refs, 1976
Production of hydrogen by closed-cycle thermochemical cracking of water, using compounds of iron, zinc, and bromine, as intermediate materials, is proposed. The maximum operating temperature is expected to be less than 500°C. The quantity of heat required is estimated from enthalpy of formation of reactants and products. It is proposed to harness solar radiation for this process.

(CONCENTRATORS)

ST77 19047 ISOMERIZATION FOR PHOTOCHEMICAL SOLAR ENERGY STORAGE

Schwerzel, R.E., Nathan, R.A., Patent, Jan 25, 1977, US Patent 4,004,571, EDB-77:060548
An invention is described relating to photochemical collection, storage, and retrieval of solar energy through exposing to solar energy in the visible light spectrum of a photochemical valence isomerizable composition for a time converting a significant portion thereof to an intramolecular strained ring structure of higher energy content, retaining the higher energy content intramolecular strained ring structure until energy release is desired therefrom, and subsequently initiating conversion of the higher energy content intramolecular strained ring structure to its initial molecular structure through application of heat and/or catalyst thereto with a resultant exothermic conversion releasing heat in excess of that requisite for initiating and continuing the conversion and with the heat in excess thereof available for useful thermal applications.

(PATENT, CHEMICAL-REACTIONS, PHOTOCHEMISTRY)

ST77 19048 ENERGY CONSIDERATIONS IN HHE POWER SYSTEMS

Scott, R.E., (Univ of Pet & Miner, Dhahran, Saudi Arabia), Heliotech and Dev, Proc of the Int Conf, Dhahran, Saudi Arabia, Nov 2-6, 1975, Publ by Dev Anal Assoc, Cambridge, MA, V 1:777-784, 6 refs, 1976
A Helioelectrolytic scheme is examined which is similar to a Heliohydroelectric system. A hole is dug into the earth and water is allowed to fall into it. At the bottom the water is collected and electrolyzed to hydrogen and oxygen. These gases escape to the surface of the earth via a second hole. Energy is abstracted from the water as it falls by means of conventional turbines. The gases are also available at the surface for recombination and energy release. The energy relationships of this system are examined and compared with the conventional Heliohydroelectric system.

(ELECTROLYSIS, HELIOHYDROELECTRIC-SYSTEM)

ST77 19049 SOLAR ENERGY AND HYDROGEN POWER: PRESENT STATE OF THE PROBLEM (FROM THE FOREIGN PRESS)

Sheklein, A.V., Appl. Solar Energy, USSR, V 12:57-62, N2, 1976, EDB-77:060485, English Translation
The possibility of using solar energy to produce commercial amounts of molecular hydrogen is considered.

(HYDROGEN-PRODUCTION, REVIEWS)

ST77 19050 WORLD HYDROGEN ENERGY CONFERENCE, 1ST, MIAMI BEACH, FL, MAR 1-3, 1976, PROCEEDINGS. VOLUMES 1, 2 & 3

Veziroglu, T.N., ed., (Miami, University, Coral Gables, FL), V 1:703, V 2:832, V 3:716, Pergamon Press, New York, NY, 1976, Conference Sponsored by ERDA and University of Miami Coral Gables, FL, University of Miami, A77-33326, Volume 1 only N77-21552, For Individual Items See A77-33327 to A77-33442, Price of Three Volumes $150

The papers collected in these three volumes deal with advances in research on means of producing hydrogen, storing and transmitting hydrogen, and design of systems using hydrogen as fuel. Nuclear energy, solar energy, coal energy, thermochemical processes, and electrolytic processes are examined as the main energy sources and conversion processes. Other topics include transmission systems, cryogenic storage, hydrogen storage on highway vehicles, metal hydride storage and its material considerations, hydrogen as aircraft fuel, development of a liquid hydrogen car, and hydrogen safety problems.

(CONFERENCES, ENERGY-TECHNOLOGY, HYDROGEN-BASED ENERGY, ELECTROLYSIS, STORAGE, HYDROLYSIS, PYROLYSIS)

ST77 19051 SOLAR PRODUCTION OF HYDROGEN AS A MEANS OF STORING SOLAR ENERGY

Veziroglu, T.N., Kakac, S., (Univ of Miami, Coral Gables, FL), Heliotech and Dev, Proc of the Int Conf, Dhahran, Saudi Arabia, Nov 2-6, 1975, Publ by Dev Anal Assoc, Cambridge, MA, V 1:399-417, 37 refs, 1976

Various methods of producing hydrogen using solar energy are compared. Direct thermal, thermo-chemical, electrolytic, and photolytic hydrogen production, are discussed.

(STORAGE, THERMO-CHEMICAL, HYDROGEN-PRODUCTION)

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